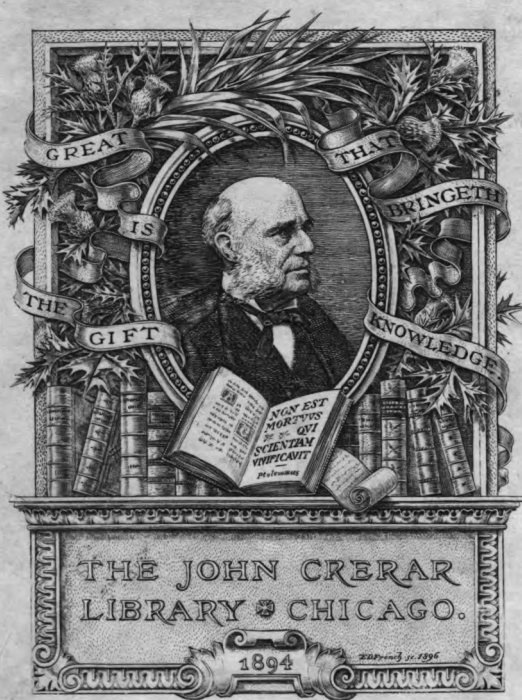

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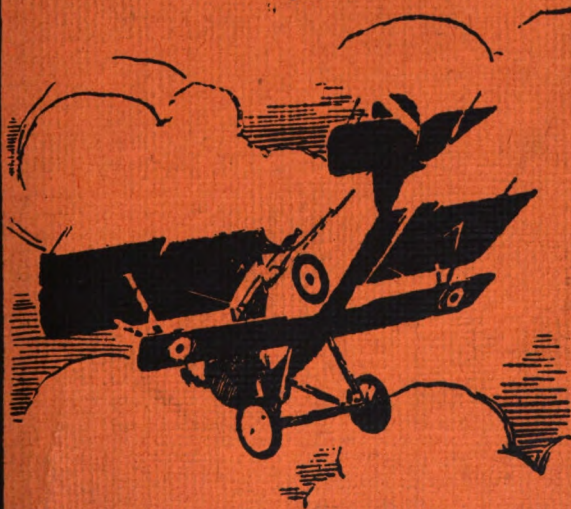


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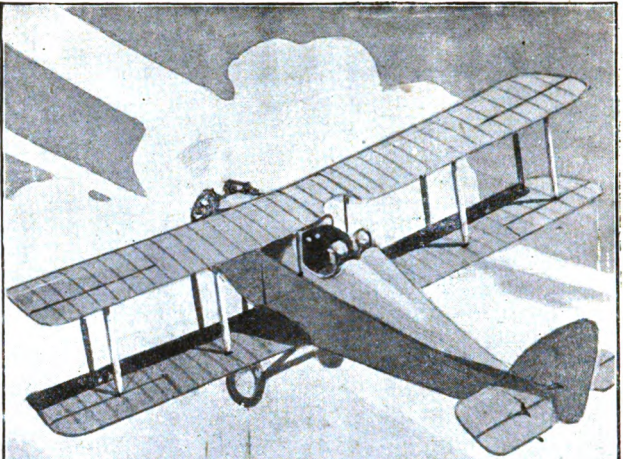


The 36
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IDENTIFICATION
BOOK

By
R. BORLASE MATTHEWS
& G. T. CLARKSON



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A COMPENDIUM OF MODERN PRACTICE AND A
COLLECTION OF USEFUL NOTES, FORMULÆ, RULES
TABLES, AND DATA RELATING TO AERONAUTICS

BY

R. BORLASE MATTHEWS

Associate Member of the Institution of Civil Engineers;

Member of the Institution of Electrical Engineers;

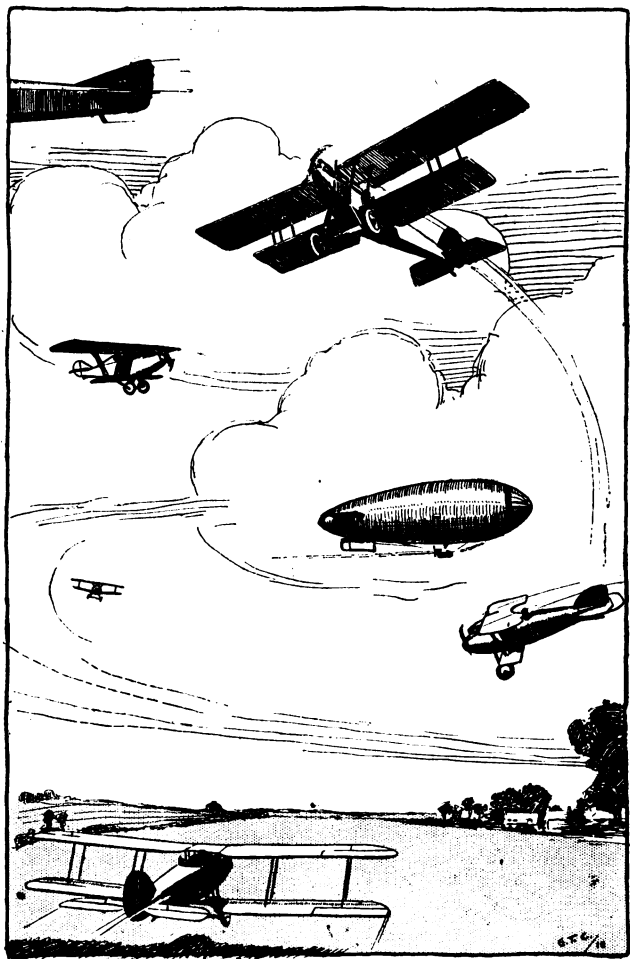
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Whitworth Exhibitioner

Abridged List of Contents—1918 Edition

AIR Pressure and Resistance.—Aeroplane Design.—Materials for Aeroplane Construction—Timber—Ferrous and Non-Ferrous Metals — Non-Metals — A.G.S. Parts. — Air-screws.—Engines.—Typical Aeroplanes.—Aeroplane Alignment and Rigging.—Piloting and Aerial Navigation.—Instruments—Meteorological Data—Scouting and Signalling.—Aero Clubs and Societies.—BIBLIOGRAPHY.—The Filing of Aeronautical Data.—Glossary of Terms used in Flying.—Conversion Tables—Squared Memorandum Paper. Index and a Directory of Manufacturers.

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A TEST

This illustration is intended to serve as an exercise to enable the reader to test for himself the principles set forth in this book (see pp. 23-26). A key is provided at the end of the Airship Section (page 98).

The Aircraft Identification Book

A CONCISE GUIDE TO THE RECOGNITION
OF DIFFERENT TYPES AND MAKES OF ALL
KINDS OF AEROPLANES AND AIRSHIPS

BY

R. BORLASE MATTHEWS

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WHITWORTH EXHIBITIONER

AUTHOR OF THE "AVIATION POCKET-BOOK," ETC.

AND

G. T. CLARKSON



LONDON

CROSBY LOCKWOOD AND SON

7 STATIONERS' HALL COURT, LUDGATE HILL, E.C. 4, AND

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PREFACE

JUST as one make of motor car can be distinguished from another by noting some characteristic detail, such as the radiator, the trade mark, the hubs, etc., so can the main types of aeroplanes and airships be readily differentiated by the recognition of the outstanding features of each machine. It must be admitted, nevertheless, that it needs considerable experience to be able definitely to classify detail modifications of a particular type of aircraft, for the difference is often very slight. Besides, the machines are frequently only visible at a great distance, and for but short periods (their speed being so high—60 to 150 miles per hour). There are, moreover, physical difficulties to contend with, in the form of clouds, effects of winds, position of the sun, etc.

It is claimed, however, that this book will enable the reader to identify any aircraft, provided it can be seen for sufficient time to observe its main features. As the time element, combined with experience in observation, are such important factors, it will not be possible to positively recognise every airship and aeroplane that appears in the offing. Still, with the help of this guide, even under adverse conditions, identification will be rendered more practicable.

The book is admittedly incomplete, for it is not advisable to incorporate particulars of the latest aircraft, or in fact of any machines, examples of which have not been captured by the enemy and mentioned in their press. Blank spaces

are, however, provided, so that the owner of the book may enter particulars of the newer aerial apparatus for himself at a later date. As this book will be revised annually, it will be possible each year to include more and more details of the latest flying machines.

The authors would much appreciate any comments or suggestions from readers that would tend to improve this book, and so render it of greater value to that ever-growing body of men to whom accurate recognition of an aeroplane is not a mere matter of transitory interest, but rather of advancing a solution to a problem that may prove of vital importance.

R. BORLASE MATTHEWS.
G. T. CLARKSON.

LETRICHEUX BUILDINGS,
SWANSEA, *July* 1918.

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FOREWORD

THIS publication is essentially a work of reference, and certainly not of the class to be absorbed in a sitting. Its main purpose is covered by the collection of identification diagrams of aircraft. The descriptive matter at the outset is intended rather as an introductory help to be read through before studying the diagrams. The practical use of this handbook (after a preliminary perusal of the reading matter) consists in reference to the analytical tables (see pp. 23-26) immediately preceding the illustrations, and from thence to the diagrams which cover the features of the type of aircraft it is wished to identify.

The identification diagrams have been prepared upon a uniform system. They comprise (1) a side view of the complete aircraft; (2) a front view, also of the complete machine (to a smaller scale); and (3) a plan view of the tail (to a much larger scale). It must be noted that owing to exigencies of space all the diagrams are not to the same scale. The span in nearest tens of feet is indicated by the figure in a circle, which appears to the right of the end view on the majority of the diagrams. Aeroplanes that are marked with a pair of crossed swords  are of the fighting type.*

It will be noted from a perusal of the list of contents that this work has been divided into five main divisions, viz.: (I.) Aeroplanes (except Seaplanes); (II.) Seaplanes; (III.) Airships; (IV.) Relative ranks of the services; and (V.) Numerical classification of aeroplanes.

Aeroplanes, considered apart from airships, might, in the early days of aviation, have roughly been divided into two classes—those which would fly and those which would not. It must be admitted that the latter were by far the larger class—if mere hops off the ground were disregarded. In

* It has not been possible to complete this marking in the present edition.

those days, then, when the total number of aeroplanes was but few, it was of more immediate interest to be able to ascertain, by a glance at the lines of the aeroplane, whether it would fly or not. To-day the position is changed, for so much is now known about the inherent principles of design, that the aeroplane that will not fly, is practically non-existent. What is of real significance now, however, is to possess the ability to distinguish one type from another. This is by no means an easy matter, for at the present stage of the development of the aeroplane, types of such close similarity have been evolved, that only the expert can really distinguish them. As in all other subjects, it is the attention given to what may appear to be the minor details of construction, and a knowledge of their relevance, that marks out the expert from the amateur. It is this easy confusion of minor differences in modern aeroplanes, that makes it essential to attack the problem along strictly logical lines. Hence the suggestion of the following out of a systematic classification (see pp. 23-26). When some such scheme has been thought out, progressive elimination will quickly lead to accurate diagnosis.

With the view to rendering assistance in this analysis, the scheme herein set forth has been prepared. In this connection it may be remarked, that though the diagrams have deliberately been made simple by the rejection of all conflicting and irrelevant matter, special pains have been taken to make them strictly accurate from a technical point of view, as so much depends upon details in arriving at a correct recognition of aircraft.

Following the identification diagrams will be found a Numerical Classification, which gives the key to the number inserted on the upper right-hand corner of the description of each aeroplane. This classification scheme is not essential for the identification of aeroplanes, but many readers, especially those who wish to enter closely into the subject, will find it of very great assistance.

Immediately prior to the Numerical Classification, diagrams are given for reference purposes, of the relative ranks and distinguishing insignia of the Services.

DIVISION I

AEROPLANES

(Excepting Seaplanes, see p. 77)

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AEROPLANE INSIGNIA

OWING to the close similarity in appearance of many aeroplanes and airships, whether employed by Allies or enemies, the only really reliable guides for differentiating between them are, firstly, hostile action, and then the national insignia or markings.

The nationality markings are, however, in a constant state of flux, and considerable latitude exists as to the exact position and form of the markings. All that can be stated definitely is, that an aeroplane marked with concentric rings and/or parallel stripes fights on the side of the Allies, whereas one with any form of black cross (Maltese or otherwise) is on the side of the Central Powers.

A brief survey of the system of insignia may not be out of place here.

Instead of a flag, which is unsuitable, aeroplanes of the belligerent powers bear distinctive markings, based on the colours of the flag of the country they represent. The early British naval seaplanes used to employ the design of the Union Jack, but this was subsequently replaced by a red circle, or more recently by a red centre, surrounded first by a white ring (or the natural colour of the fabric), and then by a blue ring—which is the standard for the army.

The positions for these markings are near the tips on the upper surface of the upper plane, and in similar positions on the underside of the lower plane. A similar mark is also placed on each side of the fuselage, between the aviator's seat and the tail of the machine. The ring markings are not, however, employed on the rudders. In this latter position it is usual to employ striped markings, *e.g.*, Great Britain uses vertical blue (next to rudder post), white, and red stripes. France has red (next to rudder post), white, and blue vertical stripes on her aeroplane rudders, with circles of reverse colouring to the British in other positions. The Belgian, Roumanian, and Serbian colours are like the French, though formerly the Belgians employed their national colours of black, yellow, and red—the black being at the centre.

The Russian marks corresponding to their flag are white, blue, and red. They also have now adopted the circle system. Hence aeroplanes of the Allies have this in common that they all use circles. The Italian circle mark has a red centre, surrounded by a white ring and green outer circle.

The U.S.A. mark on the planes was originally a five-pointed white star with a red centre, on a circular background of blue, but is now changed to red, blue, and white circles, the white being in the centre. The diameter of the white circle is one-third, and that of the blue two-thirds of the diameter (5 ft.) of the outer red circle. Of course, if the chord is less than 5 ft., the diameter of the insignia is reduced accordingly. The rudder marks are red (next to rudder post), white, and blue vertical stripes.

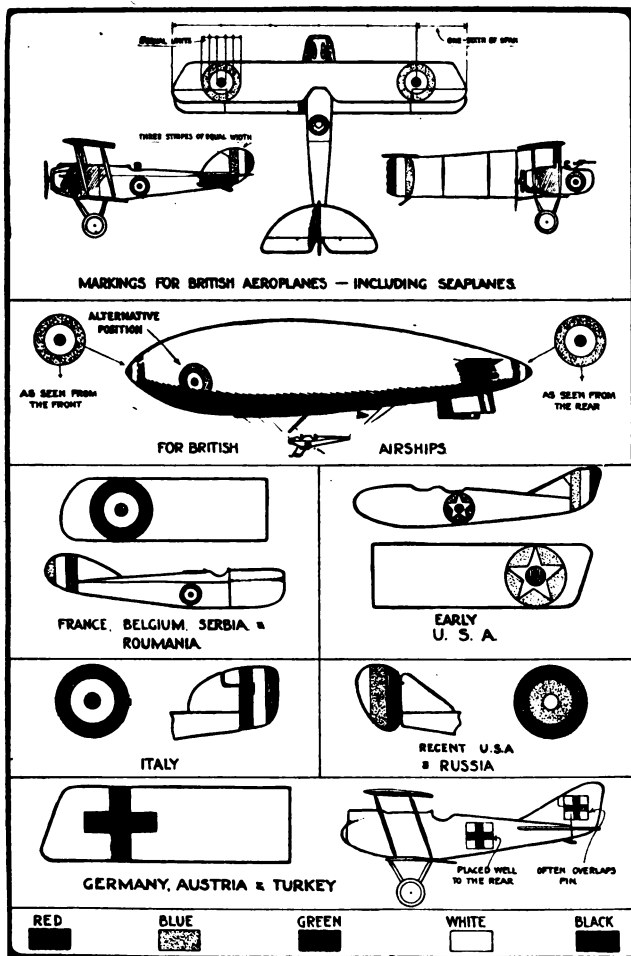
The German, Austrian, and Turkish distinctive mark is the well-known German Maltese cross on a white ground. This Maltese cross was universally used on enemy aeroplanes until June 1918. During that month, the marking of every enemy aeroplane on the western front was changed, and parallel-sided crosses were substituted. This change took place in one night, with the obvious purpose of trapping any Allied aeroplane carrying German markings, if there were any so marked. Also, it was stated, the new marking is not so likely to be easily confused with that of the Allies. Turkish aeroplanes bore a white star and crescent on a red ground, but of late the German cross has been adopted. In addition to the German cross, the Austrian machines often bear the national white and red stripes painted on the extremities of the wings. As well as the national emblems, aeroplanes usually carry a number and class mark to indicate the service upon which they are engaged.

SOME NOTES ON CAMOUFLAGE

One of the most important factors in aerial warfare is the surprise attack, and the invisibility of aircraft has a great deal to do with effecting it successfully. It is plainly evident, therefore, that camouflage is a matter of considerable importance. It has its limitations, that is to say, no system of painting can render an aeroplane invisible under varying conditions. Moreover, if the machine is seen from below, silhouetted against bright white clouds, no surface markings of any kind will conceal it. On the other hand, the plane may be very effectively hidden when seen from above, if camouflaged with the more pronounced splashes of colouring exhibited in its background. A night flyer, too, can be fairly disguised even when the searchlight is directed full upon it.

The best system of camouflage when the background presents a grey atmosphere is undoubtedly that of patches of moderately bright, and at the same time light, colours, placed in juxtaposition. Just as a disc made up of sectors of prismatic colours appears white when spun rapidly, so these colours merge into an atmospheric grey, with much better results than the leaden colour that would otherwise be produced by painting with a flat colour. A glance at a sky painted by a clever impressionist artist, shows how coloured patches blend at a short distance, into a remarkable imitation of atmosphere.

The painting of aircraft with aluminium paint has been tried, and is no doubt extremely effective in misty weather, but it flashes brilliantly in direct sunlight. As a general rule, an aeroplane should be camouflaged, to suit the most prevalent weather conditions occurring in connection with the particular work of that machine. For even if in untoward circumstances it must fly in an atmosphere unsuited to its particular system of painting, it will be no worse off than if it had no camouflage at all.



Aeroplane Insignia

The best camouflage schemes have continuous bands or stripes lengthwise along the machine, rendering the forward motion much less visible than if the bands were placed transversely to the line of flight. Another common feature of camouflage is the separation of the tail of an aeroplane by painting it a totally different tone and colour from the rest of the fuselage.

Of course the fact that glaring concentric rings and other devices of insignia are painted as clearly as possible in prominent places makes all aeroplane camouflage more or less paradoxical.

CHARACTERISTICS OF GERMAN AEROPLANES

Almost from the outset of the history of aviation, German aeroplanes have possessed marked peculiarities, rendering them easy to distinguish at sight from those of other nationalities, and it is only comparatively recently that they have become less dissimilar. At the time when all aeroplanes belonged emphatically to one of two distinct types—the Farman type of pusher “box kite” and the Bleriot tractor monoplane—German designers began to concentrate on tractor monoplanes with pretensions to inherent stability. These monoplanes or “tauben” (doves), as they were called, had, as a general rule, swept-back wings with curved outlines, enormous tail planes, often extending almost to the trailing edge of the wings, a truss girder system of wing bracing, and a vertical water-cooled engine. About 1914 this type gave place to tractor biplanes, still showing distinct traces of Taube influence, especially in the shape of wings and empennage.

Omitting all reference to deliberate German copies of French or British machines, of which the Fokker is a glaring example, the average German aeroplane of to-day may be described in the following way :—

It consists of a tractor biplane with a vertical six-cylinder water-cooled engine; a cabane type centre section supporting the radiator; a streamlined fuselage with rounded nose, and triangular or well-rounded tail planes and fins. The undercarriage is generally of steel tubing, widespreading when viewed from the side, and often having a claw brake attached to the axle, although this practice is becoming much less frequent.

The wing tips are for the most part raked, and the elevators—frequently fixed to the upper planes only—are usually hinged on a false spar several inches behind the rear spar. The elevator lever usually works in a slot cut in the upper plane.

A wash-out at the wing tips (*i.e.*, the trailing edge of the plane lifted at the tips, so as to lessen its angle of incidence) is very characteristic of most German aeroplanes, as is also the balancing of the control members.

Aeroplanes with the radiator in the nose, or with the upper extremities of the front and rear limbs of the undercarriage Vee close

together, as is common in Allied planes, are very rare amongst German machines.

The sweep back of the wings which used to be so marked a feature is no longer of much assistance as a guide, but the fact that the dihedral angle of the upper planes starts from the centre line, and the absence of a horizontal centre section, is still some indication of German nationality. The lower plane is often smaller in area than the upper, in enemy aircraft, and undivided elevators are common.

When considering large multi-screw bombing aeroplanes, the most striking characteristic in the case of the enemy is the monoplane tail (generally triangular), but the similarity on both sides of the most recent large bombers is becoming more and more apparent.

THE MARKING OF GERMAN AEROPLANES

As a means of identifying the various types of aeroplane the following letters of the alphabet are employed, viz. :—A, B, C, D, E, and G. These characters are followed by a Roman numeral, which is indicative, as the number increases, of the latest and most powerful patterns of each type :—

- (A I) Taube monoplanes of the following makes :—Albatros, D.F.W., Etrich, Jeannin, and Rumpler (now obsolete).
- (A II) Fokker.
- (B I) 100 H.P. Tractor biplane makes : Albatros, Aviatik, D.F.W., and L.V.G. (now obsolete).
- (B II) Albatros, Aviatik, D.F.W., and L.V.G., of designs brought out at the end of 1915.
- (C I, etc.) Two-seater general purpose biplanes used for artillery observation, fighters, photographic reconnaissance, etc. The engine is usually a 220 H.P. Benz, or a 260 H.P. Mercedes, although some two-seater fighters are equipped with a 180 H.P. Mercedes.
- (D) Single-seater scout fighting biplanes of Albatros, Ago, Fokker, and Halberstadt, etc., makes. ("Doppel-decker" or biplane type.)
- (E I) Parasol type monoplanes of Fokker and Pfalz makes, adapted from the French Morane design, equipped with 160 H.P. Ueberursel (Gnome) engines (constructed during 1915). ("Eindecker," or monoplane type, now obsolete.)
- (G) Large bombing biplanes :—Gotha, A.E.G., Albatros, Friedrichshafen, etc., with multi-airscrews. (The letter "G" corresponds to "Grossflugzeug," or Giant aeroplane type.)

THE MARKING OF BRITISH AEROPLANES

In the earlier days of military aviation, a lettering classification plan was put into effect on Government machines, traces of which system are still extant in a few machines of private manufacture. The letters employed were originally used to indicate the type of the machine, but latterly they designated rather the use to which the aeroplane was put. Thus "B.E." indicated initially "Bleriot Experimental," whilst "F.E." meant originally "Farman Experimental"; again, "R.E." described a "Reconnaissance Experimental," and "S.E." was associated with "Scout Experimental." Notwithstanding the significance of the term "experimental," many aeroplanes bear it, which have been constructed in their thousands.

Nowadays, since a more minute specialisation in the service is required of an aeroplane, a much more elaborate and effective classification exists for the purpose. At the present juncture a complete explanation cannot be given, beyond stating that the apparently fancy names borne by modern machines divulge to the initiated their make and type.

Individual squadrons also have their special methods of numbering and lettering the aeroplanes allotted to them. The whole problem, therefore, of recognising an aeroplane by its letters and numbers is apt to be a very complicated one, and no further reference will be made to it in this book.

TYPES OF FIGHTING AEROPLANES

- (i.) Fighters—(a) Single Seater, (b) Two Seater.
- (ii.) Fighter Reconnaissance.
- (iii.) Bombers.
- (iv.) Ground Target Attackers (low altitude).

(i.) *a.* **Single Seater Fighters**, or, as they are often called, Scouts, are essentially offensive fighters, for which purpose it is imperative that they should be very fast, easy to manoeuvre, excellent climbers, and suitable for diving steeply at an enemy from a considerable height. They are usually equipped with two or more machine guns arranged for firing through the airscrew in a fixed position relatively to the path of the aeroplane. There is no provision made for firing to the rear, and consequently they are at a disadvantage, if attacked by an aircraft of higher speed than themselves. This class of aeroplane can often attack superior numbers of slower machines with impunity, as they can withdraw from a fight whenever it suits them.

(i.) *b.* **Two Seater Fighters** are generally rather inferior to Single Seaters in matter of speed, manoeuvring, and climbing, but, on the other hand, they are very suitable for maintaining a prolonged fight, as they are less vulnerable to attacks from the rear and flanks. In

addition to the armament usually provided on a single seater, a two seater is equipped with a machine gun behind the main planes, arranged for operation by the observer. This gun is placed on a mounting of such design, to give as wide an arc of fire as practicable towards the rear and flanks. At the same time, the forward gun or guns are their principal armament. This class of aeroplane is usually flown in such a manner as to allow the observer to make the greatest possible use of his gun while the machine is being manoeuvred to gain or regain the initiative.

(ii.) **Fighting Reconnaissance Aeroplanes.**—These are usually of the Two Seater Fighter type, carrying an observer; they are not, however, primarily intended for fighting purposes, as their main business is to gain information by observation and to take photographs, etc. They must nevertheless be so equipped that they can fight their way through, when necessary for the obtaining of any such information. These aeroplanes can be flown unaccompanied, when their work is carried out at heights of 15,000 ft. or more.

(iii.) **Bombing Aeroplanes.**—As the name indicates, these aeroplanes are designed for carrying and dropping bombs. Their armament, similarly to that of the reconnaissance machine, is for defensive fighting only, so that they may be self-protecting, even when loaded. The principal object of carrying one or more guns, is to enable the aeroplane to protect itself, while forcing its way to its objective. If more than one passenger is carried, they are severally provided with machine guns. These aeroplanes are sometimes classed, according to the load they can carry, as "light" or "heavy" bombers respectively. They are likewise classed as "long or short distance" bombers.

(iv.) **Ground Target Attackers (Low Altitude).**—These are usually single seater fighters of exceptional speed and manoeuvrability, with a very good downward view. The climb is of relatively minor importance. Some more of the vulnerable parts are often protected by armour plating, and this type is frequently adapted for carrying a few light bombs.

RECOGNITION OF AEROPLANES WHEN IN THE AIR

From the ground an observer sees an aeroplane in flight more or less in plan as a rule, whereas the pilot in the air sees it more often in elevation, in which case it presents a very much smaller surface, and is therefore much more difficult to recognise. The situation is complicated by the background, which may vary from clear or cloudy sky, to the chequered ground surface below. These difficulties are not in any way relieved by the fact that the pilot's own machine offers numerous obstructions to the view, owing to the intervening portions of its main planes, fuselage, etc.

Surprise attack is of the greatest consequence when fighting enemy

aeroplanes, and one of the most important features in effecting this element of surprise, is that the pilot should see the enemy aeroplane before the enemy sees him. On the ground, an observer gets a guide as to the whereabouts of a hostile machine by the noise of its engine and airscrew; the pilot, on the other hand, owing to the overwhelming noise of his own aeroplane, cannot pick up outside sounds, so that a good look-out must be steadily maintained. It is very essential that this look-out should be performed in a methodical manner, planned so as to treat the sky as divided up relatively to fixed points on the aircraft, say into three divisions, by points located from the outer main plane and centre section struts. The eye should then be systematically swept across each section of the sky between these points, very carefully, from side to side and downwards. Search should be made from the port main plane tip to the centre section, and the process repeated from the centre section to the starboard main plane tip. From the starboard main plane tip, a steady sweep upwards should be made to the port main plane tip. While this covers the look-out ahead, it must not be forgotten that it is equally important to keep a good observation to the rear, in order to avoid surprise. This can be accomplished by swinging from side to side now and then. Methodical and systematic search of the sky in this way frequently enables a pilot to pick up another aeroplane, which he might have quite likely missed, if he had only examined the sky at random.

A very good precautionary measure, when in an aeroplane in a fighting area, is to assume that any aeroplane in sight is hostile, until proof is obtained to the contrary, by getting close enough to it to ascertain. For this purpose, it is of first importance to make a close study of diagrams and characteristics of all machines, and in addition, to what might be termed recognition characteristics, it is necessary to fully appreciate the performance and tactics of each type, to locate its blind spots, and the best way of attacking it, bearing in mind natural conditions such as haze, clouds, sun, etc. A flat turn on the part of a machine that has been sighted may temporarily cause the pilot to lose sight of it, as on such a turn, an aeroplane exposes much less surface to view than in the case of an ordinary banking turn, and in any case, once a machine has been observed, a very careful eye must be kept upon it or it will be lost to view.

TECHNICAL TERMS

Before proceeding with a study of the details by which one aeroplane may be differentiated from another, it may be well to refresh the memory by a glance at the diagram herewith. The larger illustration (reproduced from the "Aviation Pocket Book") shows a typical tractor aeroplane, with the main parts of its anatomy duly numbered and named. It will be noted that this particular machine has a Vee undercarriage.

1. The first part of the paper is devoted to a general discussion of the problem of the existence of a solution of the system of equations (1) for arbitrary values of the parameters α and β . It is shown that the system (1) has a solution for arbitrary values of the parameters α and β if and only if the condition

$$\alpha + \beta = 1 \quad (2)$$

is satisfied. In the case when the condition (2) is not satisfied, the system (1) has no solution for arbitrary values of the parameters α and β .

2. In the second part of the paper, the problem of the existence of a solution of the system (1) for arbitrary values of the parameters α and β is solved for the case when the condition (2) is satisfied. It is shown that the system (1) has a solution for arbitrary values of the parameters α and β if and only if the condition

$$\alpha + \beta = 1 \quad (3)$$

is satisfied. In the case when the condition (3) is not satisfied, the system (1) has no solution for arbitrary values of the parameters α and β .

3. In the third part of the paper, the problem of the existence of a solution of the system (1) for arbitrary values of the parameters α and β is solved for the case when the condition (2) is satisfied. It is shown that the system (1) has a solution for arbitrary values of the parameters α and β if and only if the condition

$$\alpha + \beta = 1 \quad (4)$$

is satisfied. In the case when the condition (4) is not satisfied, the system (1) has no solution for arbitrary values of the parameters α and β .

4. In the fourth part of the paper, the problem of the existence of a solution of the system (1) for arbitrary values of the parameters α and β is solved for the case when the condition (2) is satisfied. It is shown that the system (1) has a solution for arbitrary values of the parameters α and β if and only if the condition

$$\alpha + \beta = 1 \quad (5)$$

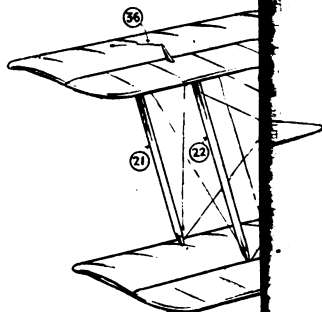
is satisfied. In the case when the condition (5) is not satisfied, the system (1) has no solution for arbitrary values of the parameters α and β .

5. In the fifth part of the paper, the problem of the existence of a solution of the system (1) for arbitrary values of the parameters α and β is solved for the case when the condition (2) is satisfied. It is shown that the system (1) has a solution for arbitrary values of the parameters α and β if and only if the condition

$$\alpha + \beta = 1 \quad (6)$$

is satisfied. In the case when the condition (6) is not satisfied, the system (1) has no solution for arbitrary values of the parameters α and β .

- ① FUSELAGE
- ② FUSELAGE TOP FAIRING
- ③ FUSELAGE TOP FORMER
- ④ FUSELAGE VERTICAL STRUT
- ⑤ PILOT'S COCKPIT
- ⑥ INSTRUMENT BOARD
- ⑦ GUNNER'S COCKPIT
- ⑧ PORT TOP MAIN PLANE
- ⑨ PORT BOTTOM MAIN PLANE



- ②5 STARBOARD OUTER FRONT INTERPLANE
- ②6 STARBOARD INNER FRONT INTERPLANE
- ②7 STARBOARD OUTER REAR INTERPLANE
- ②8 STARBOARD INNER REAR INTERPLANE
- ④3 TAIL
- ④4 TAIL PLANE
- ④5 ELEVATOR
- ④6 FIN
- ④7 RUDDER
- ④8 TAIL SKID

(NOTE.—A Portion of the drawing is shown on the reverse face page 11.

To further facilitate reference the following alphabetical index has also been prepared :—

Alphabetical Index of the Parts of a Typical Biplane

NAME OF PART.	No. ON ILLUSTRATION.	NAME OF PART.	No. ON ILLUSTRATION.
Ailerons - - - -	17	Spar, Rear - - - -	16
Axle - - - -	40	Strut, Fuselage, Vertical -	4
Axle Fairing - - - -	41	„ Port Inner Front Inter- plane - - - -	23
Centre Section - - - -	12	„ Port Inner Rear Inter- plane - - - -	24
Cockpit, Gunner's - - - -	7	„ Port Outer Front Inter- plane - - - -	21
Cockpit, Pilot's - - - -	5	„ Port Outer Rear Inter- plane - - - -	22
Compression Rib - - - -	14	„ Port Front Centre Section - - - -	31
Control Wires - - - -	36	„ Port Rear Centre Section - - - -	32
Elevator - - - -	45	„ Starboard Inner Front Interplane - - - -	26
Engine - - - -	33	„ Starboard Inner Rear Interplane - - - -	28
Exhaust Pipe - - - -	34	„ Starboard Outer Front Interplane - - - -	25
Fairing, Axle - - - -	41	„ Starboard Outer Rear Interplane - - - -	27
Fairing, Fuselage, Top -	2	„ Starboard Front Centre Section - - - -	29
Fin - - - -	46	„ Starboard Rear Centre Section - - - -	30
Former, Fuselage, Top -	3	Struts, Undercarriage - -	39
Gunner's Cockpit - - - -	7	Tail - - - -	43
Guns, Machine - - - -	37	Tail Plane - - - -	44
Instrument Board - - - -	6	Tail Skid - - - -	48
Machine Guns - - - -	37	Top Centre Section - -	12
Main Plane, Port Bottom -	9	Undercarriage, Vee Type -	38
„ „ Port Top - - - -	8	Undercarriage Struts - -	39
„ „ Starboard Bottom -	11	Wires, Control - - - -	36
„ „ Starboard Top - -	10		
Pilot's Cockpit - - - -	5		
Pipe, Exhaust - - - -	34		
Planes, Main - - - -	8, 9, 10, 11		
Plane, Tail - - - -	44		
Radiator - - - -	35		
Rib - - - -	13		
Rib, Compression - - - -	14		
Rudder - - - -	47		
Shock Absorber - - - -	42		
Skid, Tail - - - -	48		
Spar, Front - - - -	15		

TECHNICAL TERMS (*Continued*)

Struts

A strut is a structural member intended to resist compression in the direction of its length. Hence, unlike a tension member—which is usually a wire or a cable—it must always have an appreciable thickness. The arrangement, therefore, of the struts is always bound to be one of the chief features of an aeroplane, which strikes the eye upon first seeing it.

A very close study of all makes and types of present-day aeroplanes indicates that after the arrangement of the planes, the strutting affords the best clue to the correct recognition of the aircraft. Thus it is very important to be able to distinguish the varieties of struts, strut forms, and strut groupings.

On the upper portion of the diagram opposite will be found typical strut arrangements for centre sections, viz.: (a) the **normal centre section strut** arrangement; (b) the **cabane** type; and (c) the **spreading** pattern, while at the foot of the diagram (d) the **1½ strutter** form is indicated. (The expression “1½ strutter” is a non-technical, purely slang term, used by a man who wished to describe what to him appeared a novel arrangement looking like one-and-a-half struts.)

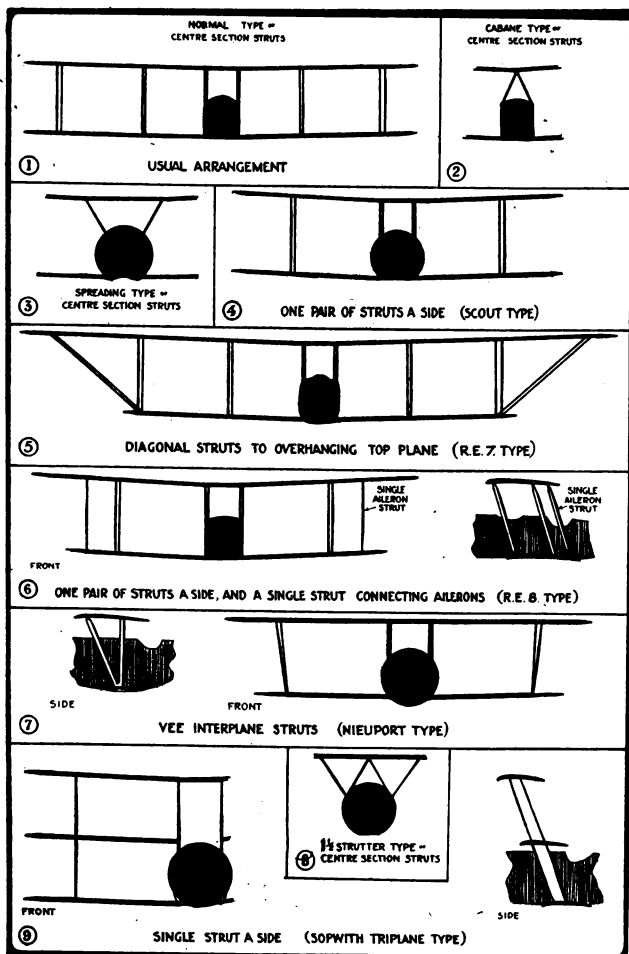
At the foot of the diagram will be noted a sketch showing a **single interplane strut** on each side of the fuselage, as employed on the Sopwith triplane, the Curtiss, and other biplanes. The fourth drawing from the top illustrates a **single pair of interplane struts** on each side of the fuselage—the usual method adopted in the construction of scout or single seater fighter aeroplanes.

The larger aeroplanes are provided with two or more pairs of struts on each side of the fuselage.

One modification of the single pair strut system is the connection of the ailerons on the upper and lower main planes by a single **aileron strut**, as in the case of the **R.E.8** biplane.

If an aeroplane has no stagger, *i.e.*, if its main planes are placed vertically, the upper one over the lower, the struts are usually set vertically; but if staggered, the struts follow the line of stagger forward or backward as the case may be. This is due to the fact that the strut socket ends are supported on the main plane spars, which latter are usually equidistant from the leading edge in both upper and lower planes. In the instance of certain aeroplanes, of which the Nieuport is typical, the lower plane may only have about half the chord or width of the upper one. In such a case, both the struts from the upper and wider plane fit into sockets on the same main and only spar of the lower plane. This pattern is usually known as **Vee Interplane Struts**.

Where the upper main plane considerably overhangs the lower main plane, as in the case of the **R.E.7** biplane, a **diagonal strut** is often provided to give additional support to the upper main plane extension.



Strut Types

TECHNICAL TERMS (*Continued*)**General Features of Main Planes, Fuselage, and Tail**

The two upper sketches indicate the difference between dihedral, *i.e.*, with the port and starboard main planes set at a slight angle to each other, the tips higher than the centre, and no dihedral, *i.e.*, with the main planes horizontal and parallel to each other. Occasionally, aeroplanes are to be seen with a dihedral on the lower planes, and not on the upper.

A trio of sketches next show the difference between forward stagger, no stagger, and back stagger (this last named is rare). In each case, of course, the view is taken from the side.

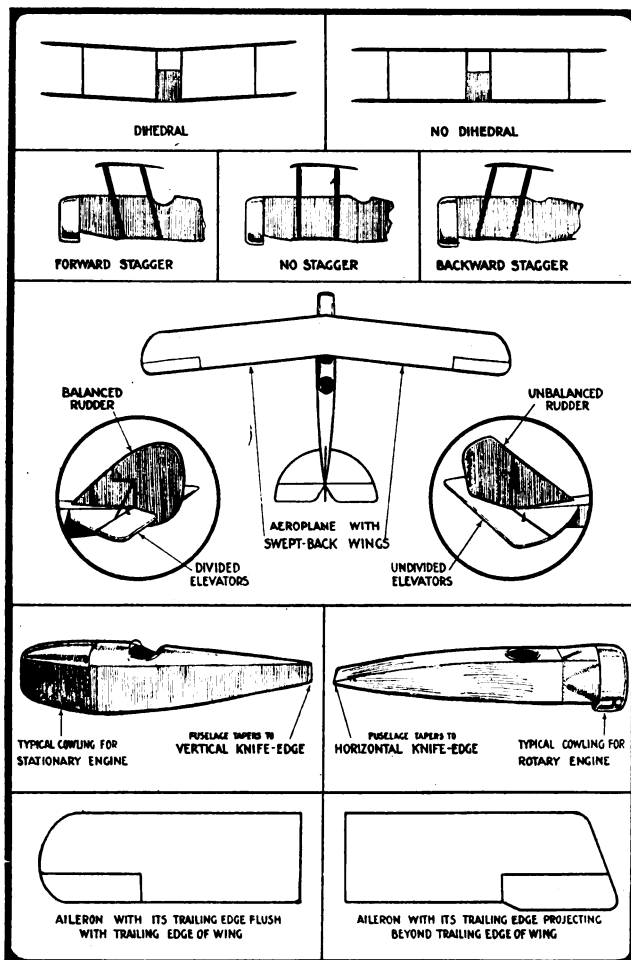
In the centre of the page will be found a plan view of a two seater aeroplane with swept-back (or arrow-like) main planes. Incidentally, it has ailerons with their trailing edges flush with the trailing edge of the main planes. Its elevators are of the divided type, and its tail plane is semicircular. On either side of this plan of an aeroplane will be noticed illustrations (contained in the two circles) which are designed to demonstrate the difference between balanced and unbalanced rudders (a balanced rudder is so formed that a portion comes on either side of the hinge upon which it is pivoted). The same illustrations also show what is meant by divided and undivided elevators. In the case of the former it will be noted that the division of the elevators is made so as to permit of the movement of the rudder, which goes below their level. Where the elevator is not divided, the lower side of the rudder must be sloped off, so as to permit of the upward movement of the elevator.

It should be clearly understood that the fact that two features are illustrated on one sketch does *not* imply that these features are always found together.

Just below the central sketch will be found two single seater fuselages; the one on the left has a typical cowling for a stationary engine, while the one on the right has a typical circular cowling for a rotary engine. The tail-ends of the fuselages are tapered to vertical and horizontal knife edges respectively to illustrate what is meant by that description.

At the foot of this page of illustrations are diagrams of a port and a starboard main plane respectively, intended to show the difference in the arrangement of an aileron (*a*) when the trailing edge of the latter is flush with the trailing edge of the main plane; and (*b*) when the trailing edge of the aileron projects beyond the edge of the main plane.

For definitions of the names of parts of aircraft, the reader is referred to the Glossary Section of the "Aviation Pocket Book."



General Features of Aeroplane Design

AMERICAN AEROPLANES (Continued)

Make.	Span.		Chord.		Gap.		Length.		Area of Planes.		Engine.		Weight.	
	Top.	Bottom.	ft.	in.	ft.	in.	ft.	in.	sq. ft.				Machine.	Load.
United Eastern Aero-plane Corp A-N	45 0	45 0	ft.	in.	ft.	in.	ft.	in.	sq. ft.		Hall-Scott 125 H.P. A-5		lbs. 1550	lbs. 900
Verville Gama SP	40 0	34 0	5	0	5	0	25	10	350		Curtiss OXX-2 100 H.P.		1500	450
Verville Beta Pusher	43 0	37 0	5	0	6	0	28	7	400		100 H.P.		1640	350
Verville Gama LP	40 0	34 0	5	0	5	0	25	0	350		100 H.P.		1360	600
Witte man TT	42 0	34 0	5	6	5	6	27	2	391		Hall-Scott A-7, 90 H.P.		1460	550
Wright-Martin R	50 8	36 10	5	6	6	0	26	8	458		Hall-Scott A-5, 125 H.P.		2005	880
Wright-Martin V	39 8.5	39 8.5	5	9.5	5	7	27	2	430		Simplex Model A Hispano- Suiza 150 H.P.		1725	805

ANALYTICAL CLASSIFICATION

ANALYTICAL CLASSIFICATION OF AEROPLANES

In cases of diagnosis, it is important to start on a logical basis. In the instance of the determination of the type of an aeroplane, the following will be found to be a good scheme of elimination to quickly arrive at the desired result.

The general characteristics should be considered in the following order; and if the particular aeroplane under consideration does not correspond to the first indicated type, then the next classification should be taken, and so on until the correct one is found.

	For Identification Diagrams, see page
Monoplanes	27
Triplanes	73
Multi-Airscrew Tractor Biplanes	55
Multi-Airscrew Pusher Biplanes	69
Pusher Biplanes, Farman Type	64
Pusher Biplanes, Types other than Farman	66
Tractor Biplanes, other than Vee Under-carriage	31
Tractor Biplanes, Vee Undercarriage	35

(See pp. 25 and 26 for details of this order of classification.)

When the class has been ascertained, it can, if necessary, be analysed in detail. In practice this further consideration is easily accomplished, with the exception of the case of tractor biplanes with Vee undercarriage, since there are a very large number of aeroplanes of this latter type. When subdivision is necessary, the best method is to first ascertain the type of the **struts** (both interplane and centre main plane); secondly, the **stagger** (the dihedral on many aeroplanes is so slight as not to be easily recognisable, especially at a distance); thirdly, the type of **engine**; and lastly, the **nationality**. The result of this subdivision will be very small groups, which will generally be found to have marked characteristics of their own.

The interplane **strut system** may be conveniently considered in the following order:—

- Single strut on each side of fuselage per interplane space.
- Vee strut ditto (*e.g.*, Nieuport).
- Single pair ditto, with aileron strut (*e.g.*, R.E.8).
- Single pair ditto.
- Two-pairs ditto.
- More than two pairs ditto.

The arrangement of the struts may be on a parallel system, or a non-parallel system. It should be noted that the majority of aeroplanes are constructed with either a single or two pairs of struts on each side of the fuselage.

Centre Main Plane Struts may be classified as (1) Normal parallel type ; (2) Cabane or inverted Vee type ; (3) Spreading or Vee type ; and (4) $1\frac{1}{2}$ strutter—a combination of Cabane and spreading type. The parallel type of centre main plane struts is the most favoured.

Having ascertained the strut arrangement, the **stagger** should be observed. The aeroplane may have no stagger, forward stagger, or back stagger. Back staggered machines are in the minority. The next step is to ascertain whether the engine is rotary or fixed (radial, vertical, or Vee types). When examining the stagger, also observe whether there is no dihedral, **dihedral** on all planes, or dihedral in the lower plane only ; lastly, the **nationality** should be noted from the identification marks, *i.e.*, whether it is (a) British, (b) one of the Allies, (c) enemy, or (d) neutral.

It is very important to be able to distinguish a friendly or an enemy aeroplane without placing reliance upon seeing the national identification markings. These markings—especially on a camouflaged aeroplane that has lost the pristine splendour of its paint work—cannot often be so easily distinguished as might be imagined. It is also almost impossible to see these marks, even if brightly and freshly painted, when the approaching aeroplane is against the sunlight. In the case of an enemy aeroplane it is important to be able to quickly recognise both the type and class to which an enemy aeroplane belongs, both for offensive and defensive tactics, so that a possible estimate can be made of the enemy's superiority or inferiority, and also where are his known "blind" areas.

As mentioned in the foreword, the identification diagrams, which immediately follow these notes, are prepared on a uniform system. An inspection will indicate that they comprise (1) a side view of the complete aeroplane ; (2) a front view, also of the complete machine (to a smaller scale) ; and (3) a plan of the tail (to a much larger scale). It must be noted that under the exigencies of space, all the three diagrams of each set are not to the same scale. The span in nearest tens of feet is indicated by the figure in a circle which appears to the right of the front view on the majority of the diagrams.

Aeroplanes that are marked with a pair of crossed swords  are of the fighting type. (This marking has not been completed in this edition.)

For an explanation of the numbers which appear at the top right-hand side of each description, refer to Division V., Decimal Classification, just prior to the index.

ANALYTICAL CLASSIFICATION SUMMARY

Monoplanes (see p. 27). Morane ; Morane Parasol ; Morane Monocoque ; Fokker ; Bleriot ; Bristol.

Triplanes (see p. 73). Curtiss ; Fokker ; Sopwith ; Caproni.

Multi-Airscrows.

Tractors (see p. 55). Caudron, G6 ; Caudron, G4 ; Morane Twin ; Atlantic ; Curtiss Canada ; Sikorski ; Vickers Vimy ; Blackburn Kangaroo ; Curtiss Twin ; Handley Page ; A.E.G. Bomber ; Letord.

Pushers (see p. 69). Wright (School) ; Friedrichshafen ; Gotha.

ANALYTICAL CLASSIFICATION SUMMARY (*Contd.*).**BIPLANES.****Pushers.**

The Farmans (see p. 64). Longhorn Maurice Farman; Shorthorn Maurice Farman; Henry Farman; Henry Farman, 1915; Horace Farman.

Other than Farmans (see p. 66). Breguet; Voisin; F.E.2.B.; F.E.2.D.; De H. 1.

Tractors.

Other than Vee Undercarriages (see p. 31). Armstrong-Whitworth; Avro (School); Caudron (School); R.E.7.

Vee Undercarriages.

Single Strut a Side (see p. 36). Curtiss Wireless; Roland 2 Str.

Vee Strut a Side (see p. 38). Albatros D.III.; Siemens-Schuckert; Nieuport; Pfalz.

Single Pair of Struts a Side and Aileron Strut (see p. 40). B.E.2.E.; R.E.8.

Single Pair of Struts a Side.**Forward Stagger.**

Rotary Engine (see p. 42). Sopwith Pup; Sopwith Camel; Bristol Scout; Sopwith 1½ Strutter.

Fixed Engine (see p. 42). S.E.5.A.; Albatros D.I.; Hannoveranner; Martinsyde F.3.

No Stagger.

Fixed Engine (see p. 44). Roland 5 Str.

Back Stagger.

Rotary Engine (see p. 44). De Havilland 5.

Two Pairs of Struts a Side.**Forward Stagger.**

Rotary Engine (see p. 46). Fokker.

Fixed Engine (see p. 46). Bristol Fighter; Spad 2 Str.; Sloane; Halberstadt; De Havilland 4; De Havilland 9; B.E.2.D.

No Stagger.

Rotary Engine (see p. 48). Ago.

Fixed Engine (see p. 50). Ago 2 Str.; Wright Scout; Spad; Albatros C.III.; Aviatik; Beatty; L.V.G.; Breguet.

Back Stagger (see p. 52). De Havilland 6; A.R.

More than Two Pairs of Struts a Side.**No Stagger.**

Fixed Engine (see p. 54). Sopwith Torpedo.

IDENTIFICATION DIAGRAMS
FOR
MONOPLANES
SINGLE AIRSCREW TRACTOR TYPE

NOTE.—For an explanation of the best way to use these diagrams, reference should be made to pages 23 to 26, if this has not already been done.

No Dihedral**MORANE.**

[French (44).]

P 11.03.41

This is the early type of aeroplane from which both parasol and monocoque patterns have been evolved.

MORANE PARASOL.

[French (44).]

P 11.03.41

The great drawback to the original Morane monoplane was the very poor downward view, which led to the parasol-like manner of placing the main plane well above the fuselage. These parasol monoplanes usually have a vertical fin.

MORANE MONOCOQUE. [French (44).]**P 11.03.41**

This is the latest version of the Morane monoplane. The fuselage differs in construction from the former types, and a vertical fin has been added, to counteract the effect of the large side area of the front of the fuselage. The essential Morane characteristics remain, viz., no dihedral, **M** type undercarriage; no fixed tail plane; and balanced control members.

FOKKER.

[German (43).]

P 11.03.41

This is an exact copy of the Morane, except for the undercarriage.

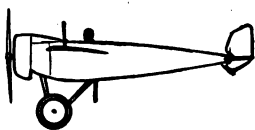
With Dihedral**BLERIOT.**

[French.]

P 11.03.51

Although only used during the first few months of the war on active service, this aeroplane has been a popular cross country machine. The open fuselage, distinctive undercarriage, and the rear skid placed in the middle of the fuselage, make it absolutely unmistakable. It has a big dihedral.

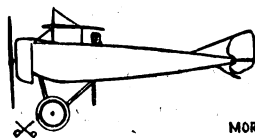
MONOPLANES



MORANE



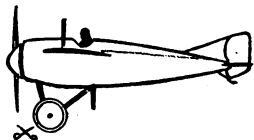
③



MORANE PARASOL



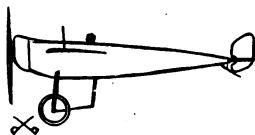
③



MORANE MONOCOQUE



③



FOKKER



③

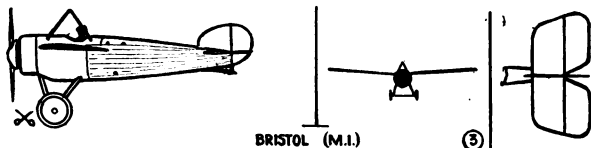


BLERIOT



③



MONOPLANES (*Continued*)**With Dihedral** (*Continued*)**BRISTOL M.I.C.**

[British (42).]

P 11.03.51

This aeroplane shares with the Morane the distinction of being the only monoplane used on active service, but differs from the Morane, inasmuch that it has a dihedral and fixed tailplanes.

**SPACE FOR NOTES BY THE READER ON NEW
TYPES OF MONOPLANES**

P 11

IDENTIFICATION DIAGRAMS
FOR
BIPLANES, SINGLE AIRSCREW
TRACTOR TYPE,
OTHER THAN VEE UNDERCARRIAGES

(See page 35 for tractors with Vee undercarriages)

NOTE.—For an explanation of the best way to use these diagrams, reference should be made to pages 23 to 26, if this has not already been done.

Without Vee Undercarriages**With two pairs of struts a side****AVRO (SCHOOL).**

[British (42).]

P 21.035.21

The undercarriage is the truest clue to the identity of this aeroplane, as it is very characteristic. It is a type that is much in use.

ARMSTRONG-WHITWORTH. [British (42).] **P 21.035.53**

The squareness of this aeroplane, together with the shape of the tail planes, and the depth of the rear portion of the fuselage, assist in identification. The radiators are not always arranged as shown, but appear sometimes as rectangular boxes fixed on the side of the fuselage.

The F.K.3 is very similar, but has an air-cooled engine, and is much less commonly seen.

With more than two pairs of struts a side**CAUDRON (SCHOOL).**

[French (44).]

P 21.036.41

This has a rotary engine, usually an 80 H.P. Gnome, and can hardly be mistaken for any other aeroplane.

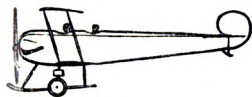
R.E.7.

[British Government (42).]

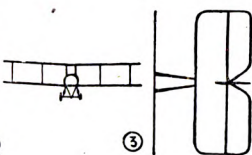
P 21.036.54

It is highly improbable that an example of this aeroplane will be seen in flight. It is included chiefly because its name has been used to exemplify a particular system of interplane struts.

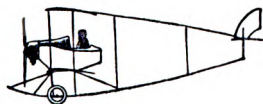
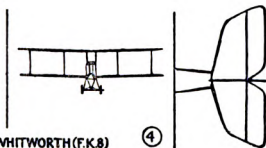
TRACTOR BIPLANES



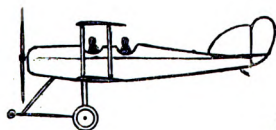
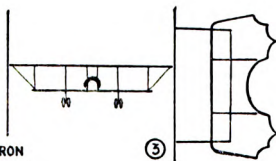
AVRO



ARMSTRONG-WHITWORTH (F.K.8)



CAUDRON



R.E.7



**SPACE FOR NOTES BY THE READER ON NEW
TRACTOR BIPLANES, WITHOUT VEE UNDER-
CARRIAGES.**

P 21

IDENTIFICATION DIAGRAMS

FOR

BIPLANES, SINGLE AIRSCREW TRACTOR TYPE

WITH VEE UNDERCARRIAGES

(See page 31 for Tractor Biplanes without Vee undercarriages)

NOTE.—For an explanation of the best way to use these diagrams, reference should be made to pages 23 to 26, if this has not already been done.

**Biplanes, Tractor Type, with single strut on each
side of fuselage** - - - - -

P 21.031

ROLAND TWO-SEATER. [German (43).]

P 21.031.13

An unmistakable design.

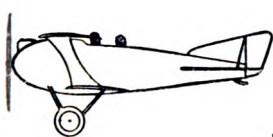
CURTISS WIRELESS. [U.S.A. (73).]

P 21.031.44

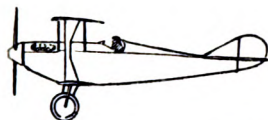
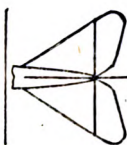
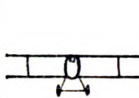
No external bracing. Cannot possibly be mistaken for any other
aeroplane.

**SPACE FOR NOTES BY THE READER ON NEW
TRACTOR BIPLANES, WITH SINGLE STRUT
A SIDE.**

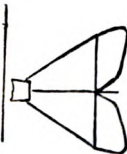
P 21.031



ROLAND



CURTISS WIRELESS



**SPACE FOR NOTES BY THE READER ON NEW
TRACTOR BIPLANES, WITH SINGLE STRUT
A SIDE.**

P 21.031

Biplanes, Tractor Type, with Vee strut on each side of fuselage

SIEMENS-SCHUCKERT. [German (43).] **P 21.034.11**

This aeroplane is almost identical in appearance with the Nieuport, except that the lower plane has no dihedral.

PFALZ. [German (43).] **P 21.034.13**

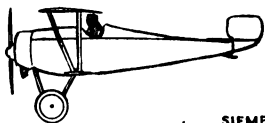
The unusual features of this biplane are so numerous that it can hardly be mistaken for any other aeroplane. These aeroplanes are usually, though not invariably, painted a silvery grey. The elevators are undivided.

NIEUPORT. [French (44).] **P 21.034.31**

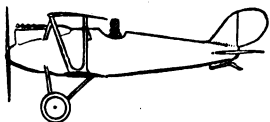
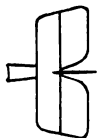
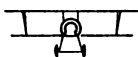
The original of many imitations. Characteristic large top plane without dihedral, but with slight sweep back. Very small lower planes, with dihedral and sweep back. Vee interplane struts. The fuselage tapers to a vertical knife edge. No fin, and the rudder is balanced.

ALBATROS D III. [German (43).] **P 31.034.33**

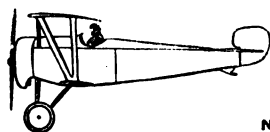
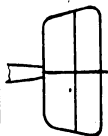
This is very similar, outwardly, to the D.V. type. Note the characteristic German tail. The struts are of steel tubing, and, therefore, appear very thin.



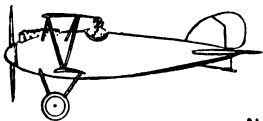
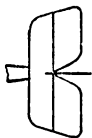
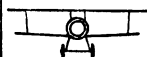
SIEMENS-SCHUCKERT



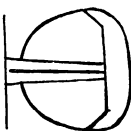
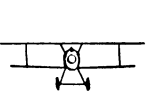
PFALZ



NIEUPORT



ALBATROS D.III



Biplanes, Tractor Type, with a single pair of struts on each side of fuselage, with aileron strut

B.E.2.E. [British Government (42).] **P 21.034.24**

This aeroplane is equipped with the same wings, tail plane, and elevators as the R.E.8. The form of the fin, rudder, skid, engine, and fuselages are the chief distinctive features.

R.E.8. [British Government (42).] **P 21.034.24**

Very similar to the B.E.2.E, but has a 12-cylinder engine (instead of an 8-cylinder). The fin and rudder are, however, quite different. Likewise the fuselages are quite dissimilar. This aeroplane always gives appearance of being bent upwards at front and rear.

**SPACE FOR NOTES BY THE READER ON NEW
TRACTOR BIPLANES, with a single pair of struts
and aileron strut.** **P 21.034**





B.E.2.E.



R.E.8



**SPACE FOR NOTES BY THE READER ON NEW
TRACTOR BIPLANES, with a single pair of struts
and aileron strut.**

P 21.034

Biplanes, Traction Type, with single pair of interplane struts on each side of fuselage

Forward Stagger, Rotary Engine

SOPWITH 1½ STRUTTER. [British (42).] P 21.034.11

- This aeroplane is practically a two-seater Pup, the only difference being (apart from size) the provision of two seats and a "W" arrangement of centre section struts. (Combined cabane and spreading systems.) An identical aeroplane, except for seating and armament, is the Sopwith single-seater bomber.

SOPWITH PUP. [British (42).] P 21.034.21

A very common machine. Notice the shape of the rudder-like semi-circular front portion of the fin, which is very characteristic of nearly all Sopwith machines. When seen in plan the similarity of the main plane tips and the tail planes is unusual and unmistakable.

BRISTOL SCOUT. [British (42).] P 21.034.21

Has been a famous war aeroplane, very uncommon now. Notice balanced rudder and the shape of tail planes. Also far-forward under-carriage.

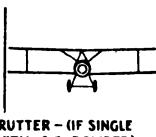
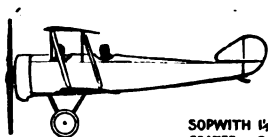
SOPWITH CAMEL. [British (42).] P 21.034.31

Notice flat top plane and pronounced dihedral on lower planes. The tail plane is characteristically Sopwith.

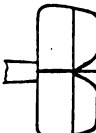
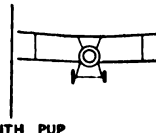
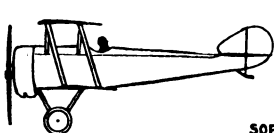
Forward Stagger, Fixed Engine

ALBATROS D 1. [German (43).] P 21.034.13

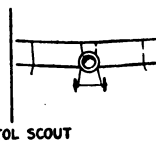
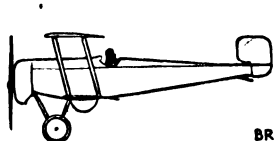
The chief of the first single-seater scouts which were so deadly to the Allies under Richthofen. The shape of the tail planes, and the employment of a 6-cylinder vertical engine form the best guide.



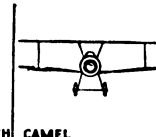
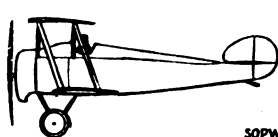
SOPWITH 1 1/2 STRUTTER - (IF SINGLE SEATER- SOPWITH S.S. BOMBER)



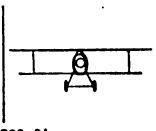
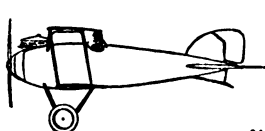
SOPWITH PUP



BRISTOL SCOUT



SOPWITH CAMEL



ALBATROS D.I

Forward Stagger, Fixed Engine (*Continued*)**HANNOVERANNER.** [German (43).] **P 21.034.23**

A German machine of very individual design. Notice the biplane tail and peculiar strutting. The idea of the biplane tail is to assist the rear gunner by giving a less obstructed field of fire.

S.E.5.A. [British Government (42).] **P 21.034.24**

Pilot sits very far back. High undercarriage, pointed forwards. Notice shape both of fin and rudder. A second fin is fitted below the fuselage. Exhaust manifold is very short. The radiator is mounted in front.

MARTINSYDE F.3. [British (42).] **P 21.034.24**

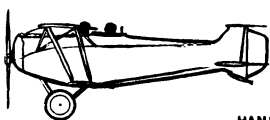
The fin and rudder are similar to the Sopwith. A stationary engine, with radiator in front, is fitted. This aeroplane is generally very much like the S.E.5.A; the tail planes embody the chief differences. It has a 350 H.P. Hispano Suiza engine.

No Stagger**ROLAND SINGLE-SEATER.** [German (43).] **P 21.034.43**

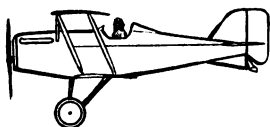
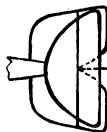
Notice the peculiar way in which the fuselage fills up the gap; no dihedral; one pair of struts a side; characteristic tail planes.

Back Stagger**DE HAVILLAND 5.** [British (42).] **P 21.034.81**

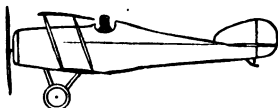
Very noticeable back stagger and characteristic de Havilland tail. Very wide rounded body.



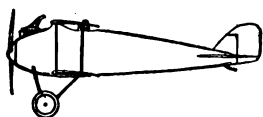
HANNOVERANNER



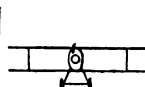
S.E.5.A



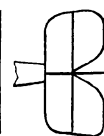
MARTINSYDE F.3



ROLAND



de HAVILLAND 5



**BIPLANES, TRACTOR TYPE, with two pairs of
interplane struts each side of fuselage**

Forward Stagger, Rotary Engine.

FOKKER.

[German (43).]

P 21.035.11

Features :—No fixed fin or tail plane ; Morane type fuselage and tail ; Rotary engine ; top plane on level with pilot's eyes ; no dihedral ; two pairs of struts a side.

Forward Stagger, Fixed Engine

SPAD TWO SEATER.

[French (44).]

P 21.035.14

This may be distinguished from the single seater, which it very closely resembles, by the presence of a second seat, and by the forward stagger given to the wings.. The characteristic Spad tail is the same as in the Scout.

SLOANE.

[U.S.A. (73).]

P 21.035.23

This American aeroplane is very similar to the Standard tractor biplane.

HALBERSTADT.

[German (43).]

P 21.035.23

The tail is an absolute copy of the Morane, while the front portion of the aeroplane is usual German practice. It is very like the Fokker, but has a fixed engine (Argus or Mercedes) and a different rudder.

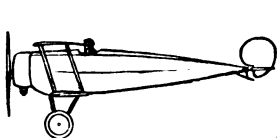
BRISTOL FIGHTER.

[British (42).]

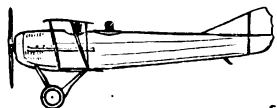
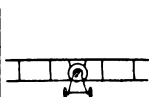
P 21.035.24

This might possibly be confused with the D.H.4 or the D.H.9, but there is no real excuse, as the Bristol fuselage finishes in a horizontal edge, and has a fin beneath the fuselage as well as above.

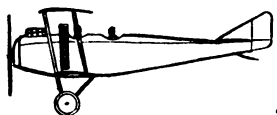
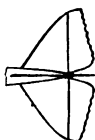
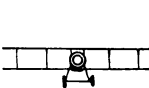
The fuselage again does not rest on the lower main plane, but is lifted above it. The undercarriage and tail are also quite different.



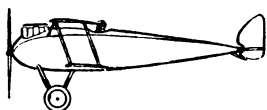
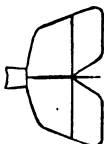
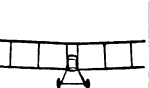
FOKKER



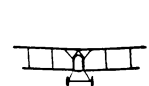
SPAD 2-STR



SLOANE



HALBERSTADT



BRISTOL FIGHTER F.2B



Forward Stagger, Fixed Engine (*Continued*)

DE HAVILLAND 4. [British (42).] **P 21.035.24**

The tail should be very carefully noted, as all the tractor D.H. aeroplanes have the same shaped fins, rudders, and tail planes. Notice the very deep front portion of the fuselage, with the radiator in front, and the squat undercarriage. Also observe the placing of the pilot relatively to the gunner.

DE HAVILLAND 9. [British (44).] **P 21.035.24**

The tail and wings are exactly as in the D.H.4. The front portion of the fuselage is very different, however, and the gunner sits immediately behind the pilot.

B.E.2.D. [British Govt. (42).] **P 21.035.24**

This is the final model of a series of tractor biplanes designed by the Royal Aircraft Factory. Notice rudder and fin, also the scoop-shaped cowl over an air-cooled Vee-type engine. The B.E.2.C. is exactly similar in appearance, but has a different wing section.

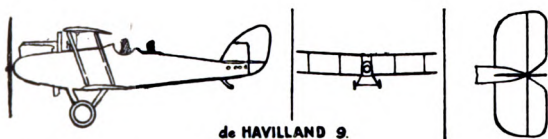
No Stagger, Rotary Engine

AGO. [German (43).] **P 21.035.51**

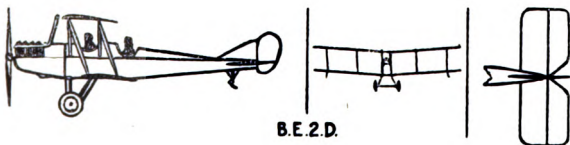
A fast single-seater with a rotary engine. The fuselage and the tail are like those of the Nieuport aeroplane, but the struts are quite different.



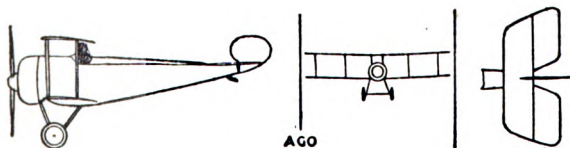
de HAVILLAND 4.



de HAVILLAND 9.



B.E.2.D.



AGO

No Stagger, Fixed Engine

AGO TWO-SEATER. [German (43).] **P 21.035.43**

The peculiar shape of the main planes, and the absence of a front inner strut, distinguish this aeroplane from all others. The place of the missing strut is taken by a wire tie, the idea being to increase the arc of fire forward, for the observer's gun.

WRIGHT SCOUT. [U.S.A. (73).] **P 21.035.43**

This machine has many distinctive features, and should present no difficulty in identification.

SPAD. [French (44).] **P 21.035.44**

An unmistakable machine, with a circular radiator, and without dihedral. The inner struts are jointed in the middle, and connected by horizontal ties.

ALBATROS C III. [German (43).] **P 21.035.53**

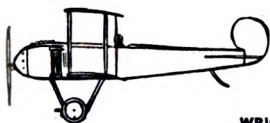
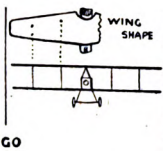
A very characteristic German two-seater. Notice tail planes, wide-spread undercarriage, engine, and radiator.

AVIATIK. [German (43).] **P 21.035.53**

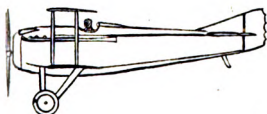
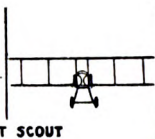
A very characteristic German aeroplane, which can be distinguished from other machines of similar nationality, only by close attention to the tail, radiator, and exhaust pipe. The main planes are slightly swept back, and the lower planes are shorter than the upper. 175 H. P. Mercedes engine.



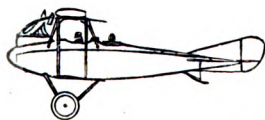
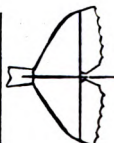
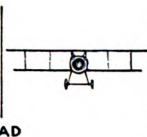
AGO



WRIGHT SCOUT



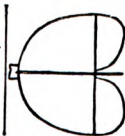
SPAD



ALBATROS (C.IV)



AVIATIK



No Stagger, Fixed Engine (*Continued*)**BEATTY.**

[British (42).]

P 21.035.53

This machine is a straightforward design for a medium powered single-seater tractor. It would rarely be met with far from the works where it is constructed.

L. V. G. (Luft Verkehrs-Gesellschaft). [German (43).] **P 21.035.53**

Very similar to Aviatik. The rudder is unbalanced, however, and the fin does not reach so far up the body as does the tail plane. The tail planes are less rounded, and the undercarriage is wider when seen from the front than that of the Aviatik. 175 H.P. Mercedes or Benz engine.

BREGUET.

[French (44).]

P 21.035.93

The tail planes and the presence of a dihedral to the top plane, while the bottom planes are horizontal (which is very unusual), make this aeroplane easily recognisable.

Back Stagger**DE HAVILLAND 6.**

[British (42).]

P 21.035.84

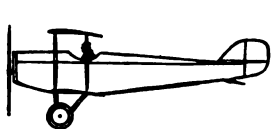
This is an aeroplane designed for slow flight, and to be as nearly fool-proof as is advisable. Notice the unmistakable squareness of all corners of the main planes, fuselage, and tail, as these are the best guide. A light strut joins the upper and lower ailerons. The engine is a Vee type, usually Renault, R.A.F. 1a, or Curtiss. This aeroplane now has a slight back stagger, though originally as shown.

A.R.

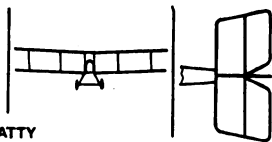
[French Government (44).]

P 21.035.94

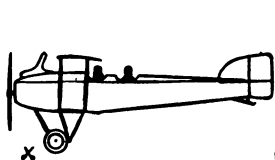
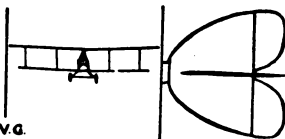
These initials stand for "Corps d'Armée" and "Renault." The new French Government biplane with water-cooled engines and radiators in front. Notice back stagger, big dihedral to the lower main plane, and the raising of the body above the lower main plane. The A.L.D. is exactly similar in appearance, but is equipped with a Lorraine Dietrich engine.



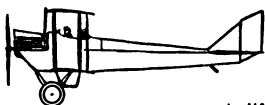
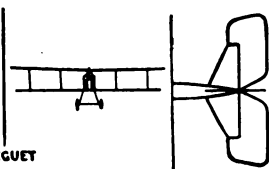
BEATTY



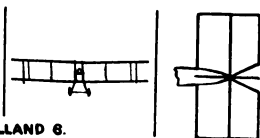
L.V.G.



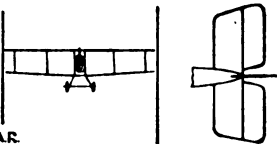
BREGUET



de HAVILLAND G.

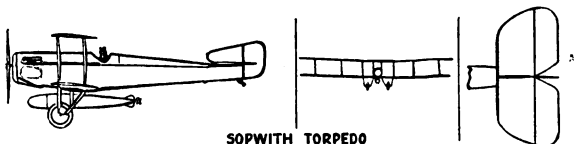


A.R.



TRACTOR BIPLANES (*Continued*)

Biplanes Tractor Type, with more than two pairs of interplane struts each side of fuselage



SOPWITH TORPEDO

SOPWITH TORPEDO. [British (42).] P 21.036.54

The undercarriage is the most distinctive feature of this biplane. There is no axle, each wheel being supported by a pair of vees. The tail is of characteristic Sopwith shape.

**SPACE FOR NOTES BY THE READER ON NEW
TRACTOR BIPLANES, WITH MORE THAN TWO
PAIRS OF STRUTS**

P 21.036

BIPLANES, MULTIPLE AIRSCREW TRACTOR TYPE

NOTE.—For an explanation of the best way to use these diagrams, reference should be made to pages 23 to 26, if this has not already been done.

BIPLANES, MULTI-AIRSCREW TRACTORS**No Stagger, Rotary Engines**

CAUDRON G6. [French (44).] **P 22.036.41**

This multi-aircrew aeroplane is similar to the Caudron R4, but has the main planes arranged similarly to the G4. The lower plane is two-thirds of the length of the upper, and the chord about one-half.

CAUDRON G4. [French (44).] **P 22.036.41**

This aeroplane differs from other multi-aircrew machines in that it has no fuselage. The lower plane is about three-quarters of the length of the upper, and has a smaller chord. It has four triangular rudders.

MORANE TWIN. [French (44).] **P 22.036.71**

The usual Morane practice has been adhered to, so far as possible, but the designer has been compelled to add fixed tail planes and vertical fin. The horizontal knife edge is retained at the rear of the aeroplane. Note the unusual undercarriage.

No Stagger, Fixed Engines

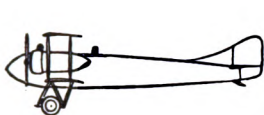
ATLANTIC. [British (42).] **P 22.036.43**

Note the monoplane tail, and the absence of dihedral.

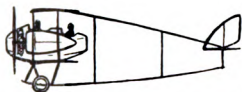
CURTISS CANADA. [U.S.A. (73).] **P 22.036.43**

This aeroplane is absolutely unmistakable.

MULTI-AIRSCREW TRACTORS



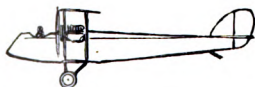
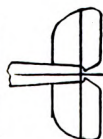
CAUDRON G.6.



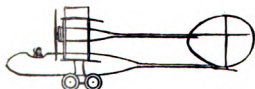
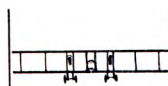
CAUDRON



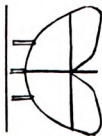
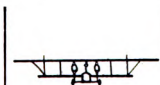
MORANE



ATLANTIC



CURTISS CANADA



No Stagger, Fixed Engines (*Continued*)**SIKORSKY.**

[Russian (47).]

P 22.036.43

An exceptionally large aeroplane, with a long body. It has a large closed-in cabin for the crew. It is fitted with an unusual type of undercarriage, and a peculiar skid for the tail.

VICKERS VIMY.

[British (42).]

P 22.036.44

Very easy to identify. Notice large gap and central skid undercarriage, additional to the vee undercarriages beneath the engine nacelles.

BLACKBURN KANGAROO.

[British (42).]

P 22.036.54

A considerable portion of the fuselage extends in front of the main planes, and there is a very big overhang to the upper plane. This aeroplane must not be confused with the Handley-Page 0.400, which is much more frequently seen; for one thing, the undercarriage arrangement is different.

CURTISS TWIN.

[U.S.A. (73).]

P 22.036.54

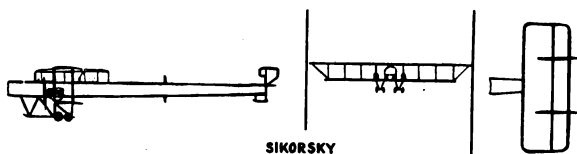
This aeroplane follows the more conventional lines of construction of a single airscrew tractor biplane. The semicircular rudder has a projecting balancing piece over the triangular fin.

HANDLEY-PAGE 0.400.

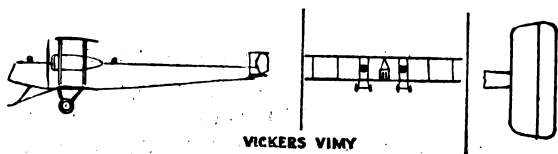
[British (42).]

P 22.036.54

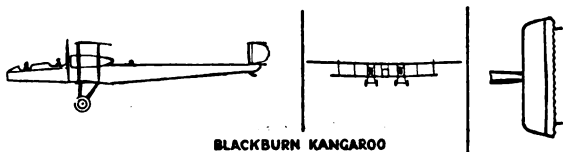
The noteworthy distinguishing features are:—The biplane tail; balanced ailerons, projecting beyond the ends and trailing edges of the main planes.



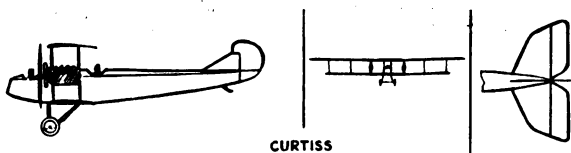
SIKORSKY



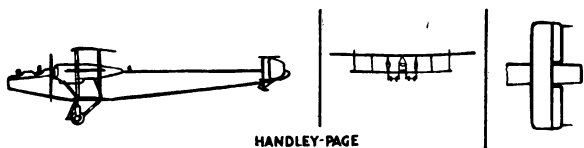
VICKERS VIMY



BLACKBURN KANGAROO



CURTISS



HANDLEY-PAGE

No Stagger, Fixed Engines (*Continued*)**A. E. G. (Allgemeine Electricitäts Gesellschaft).**

[German (43).]

P 22.036.63

It should be observed that there is a dihedral on the lower main plane only. The centre main plane strutting is an unusual arrangement.

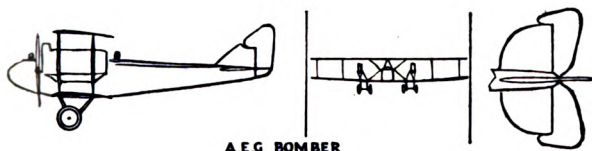
Back Stagger**LETORD.**

[French (44).]

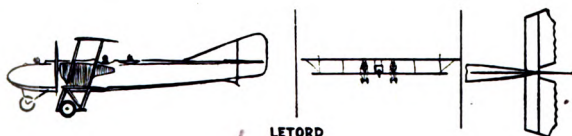
P 22.036.73

Note the extremely narrow fixed tail planes of the monoplane tail, the back stagger of the wings, and the wheel under the front portion of the fuselage. The vertical knife edge at rear of the fuselage is also characteristic.

MULTI-AIRSCREW TRACTORS (Continued)



A.E.G. BOMBER



LETORD

**SPACE FOR NOTES BY THE READER ON NEW
MULTI-AIRSCREW TRACTORS P 22**

IDENTIFICATION DIAGRAMS
FOR
BIPLANES, SINGLE AIRSCREW
PUSHER TYPE

NOTE.—For an explanation of the best way to use these diagrams, reference should be made to pages 23 to 26, if this has not already been done.

FARMAN TYPES**MAURICE FARMAN LONGHORN.**[British (42) and French (44).] **P 24.036.44**

The engine is an air-cooled Vee type, and the tail is of the biplane type, with two rectangular rudders, and undivided elevators. Also the tail booms do not meet at all, but are practically parallel in plan. The front elevator, carried on a long extension of the undercarriage, is distinctive, and inspires the term "Longhorn." (1913 type.)

MAURICE FARMAN SHORTHORN.[British (42) and French (44).] **P 24.036.44**

The nacelle is raised above the lower plane, though not otherwise altered. The tail is different from both the Henry and Longhorn Maurice. It has a monoplane tail, with twin fins and rudders. The elevators are again undivided, and the tail booms are parallel in plan, but in this aeroplane they meet at a point when seen in side elevation. The undercarriage is also different, as is made clear in the sketches. In comparison with the "Longhorn" type of undercarriage, this one is described as a "Shorthorn." (1914 type.)

HENRY FARMAN. [British (42) and French (44).] **P 24.036.41**

Notice the rotary engine, monoplane tail with ear-shaped rudder, and divided elevators. The tail booms meet at the point upon which the rudder pivots.

HENRY FARMAN (1915).[British (42) and French (44).] **P 24.036.41**

The body main planes are practically an imitation of the Voisin, as is also the undercarriage. The standard Henry Farman tail is fitted.

HORACE FARMAN. [British (42) and French (44).] **P 24.036.44**

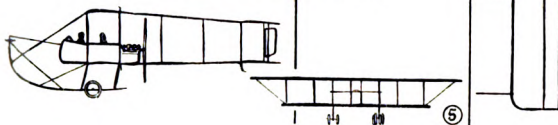
This is practically a Henry Farman with a Maurice Farman nacelle and engine.

THE FARMANS.

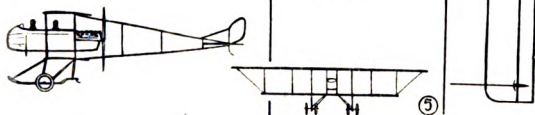
An aeroplane may easily be identified as a Farman, but close attention is necessary to identify the exact type.

PUSHER BIPLANES

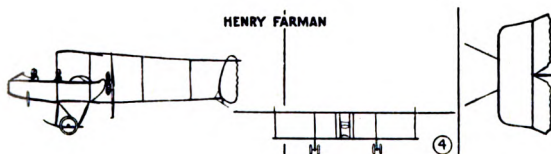
LONGHORN MAURICE FARMAN



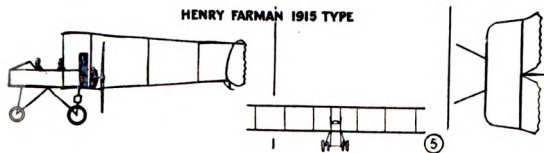
SHORTHORN MAURICE FARMAN



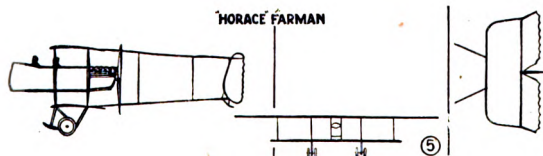
HENRY FARMAN



HENRY FARMAN 1915 TYPE



HORACE FARMAN



TYPES OTHER THAN FARMAN**With more than two pairs of struts a side****BREGUET.**

[French (44).]

P 24.036.43

This is a large pusher biplane of comparatively recent design. Notice the large body, three-wheeled undercarriage, and tail pierced by two small vertical fins.

VOISIN.

[French (42).]

P 24.036.44

Notice the peculiar four-wheeled undercarriage and the absence of dihedral. The long narrow cruciform tail is also a good guide. Many copies of the Voisin exist under varying names.

F.E.2B.

[British Government (42).]

P 24.036.53

This is an extraordinarily long-lived aeroplane, and a thoroughly sound type of pusher. It is very easily recognised by the tail and undercarriage—notice the small triangular fin over the fixed tail plane. The centre section, bounded by one pair of interplane struts on each side, is horizontal, and each side portion has a pronounced dihedral.

F.E.2D.

[British Government (42).]

P 24.036.54

The only differences between the F.E.2B and the F.E.2D are the engine and the undercarriage. The F.E.2B has a 6-cylinder vertical water-cooled engine (Beardmore), while the F.E.2D has a Vee-type 12-cylinder Rolls-Royce engine. The difference in the undercarriage is made clear in the sketch.

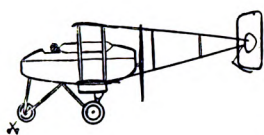
With two pairs of struts a side**D.H.1.**

[British (42).]

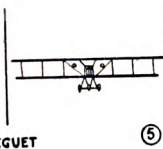
P 24.036.54

The tail makes it easy to distinguish this aeroplane from the F.E. class, and in front view it will be noticed that there are only two pairs of struts a side, as against three pairs in the F.E.2B. The D.H.2 is a smaller edition of the D.H.1 fighter, and has only one seat.

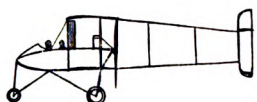
PUSHER BIPLANES (Continued)



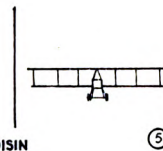
BREGUET



⑤



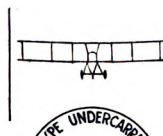
VOISIN



⑤



FE.2B



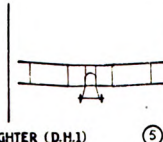
FE.2D.



FRONT VIEW AS ABOVE.



de HAVILLAND FIGHTER (D.H.1)



⑤



**SPACE FOR NOTES BY THE READER ON NEW
BIPLANES, SINGLE AIRSCREW PUSHER TYPE**

P 24

IDENTIFICATION DIAGRAMS
FOR
BIPLANES, MULTIPLE-AIRSCREW
PUSHERS

Multi-Aircrew
Pushers

NOTE.—For an explanation of the best way to use these diagrams, reference should be made to pages 23 to 26, if this has not already been done.

BIPLANES, MULTI-AIRSCREW PUSHERS

WRIGHT (SCHOOL). [U.S.A. (73).] **P 25.036.43**

This is practically the same as the original aeroplane used on Kill Devil Hill in the early gliding experiments of Wright Brothers. It is very easy to recognise. The two airscrews are usually bent, not carved, and turn very slowly, being chain-driven from the engine, which latter balances the pilot in the lower centre section. The passenger sits between the pilot and the engine, so his presence or absence makes no difference to the trim of the aeroplane.

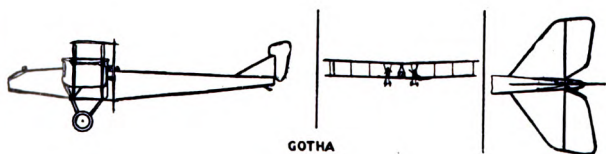
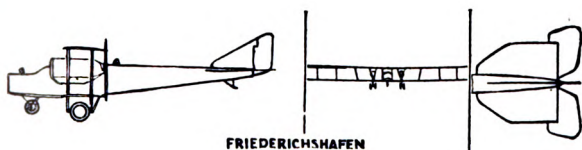
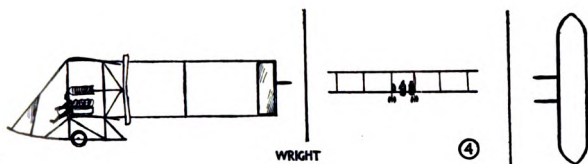
FRIEDRICHSHAFEN. [German (43).] **P 25.036.53**

Shape of body and tail planes ; small gap and peculiar sloping struts, as well as single wheel under front of fuselage, all help identification. Slight sweep back to wings.

GOTHA. [German (43).] **P 25.036.53**

The earlier types had markedly swept back wings. In the later machines, however, this sweeping back is very sensibly reduced. Unlike most aeroplanes with a fuselage, the two airscrews are of the pusher type.

MULTI-AIRSCREW PUSHERS



**SPACE FOR NOTES BY THE READER ON NEW
MULTI-AIRSCREW PUSHERS**

P 25

IDENTIFICATION DIAGRAMS

FOR

TRIPLANES, ALL TYPES

Tri-
planes

NOTE.—For an explanation of the best way to use these diagrams, reference should be made to pages 23 to 26, if this has not already been done.

**Triplanes, Single Airscrew Tractor Type with
single strut on each side of fuselage per inter-
plane space** **P 31.031**

FOKKER. [German (43).] **P 31.031.11**

This aeroplane is a close copy of the Sopwith, with the exception of the tail. The rudder is of the usual Fokker comma-like shape, and the fixed tail plane, which is triangular in shape, is of considerable size in proportion to the rest of the machine. Noteworthy features are:— The absence of dihedral; differences in span of all three planes; and the presence of a small plane between the wheels of the undercarriage, as well as the absence of bracing wires.

SOPWITH. [British (42).] **P 31.031.21**

This aeroplane has a pronounced forward stagger, and the fuselage is fitted between the lower pair of main planes. The Fokker is a close copy in appearance, but has not got the dihedral angle and unmistakable tail of the Sopwith machine. The main planes are of the usual Sopwith shape. The corners are well rounded. The engine is of the Clerget rotary type.

CURTISS. [U.S.A. (73).] **P 31.031.64**

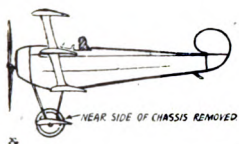
The shape of the fuselage and tail is characteristic of other Curtiss machines. The vee of the undercarriage is closed up with fabric fairing. The planes are not staggered, and only the bottom plane has a dihedral. The engine is of the Curtiss Vee type.

**Triplane, Double Airscrew Tractor, with more
than two pairs of struts on each side of
fuselage** **P 32.03**

CAPRONI. [Italian (45).] **P 32.036.43**

This is a very different kind of aeroplane from the other three triplanes referred to above. It is of a type of which a good deal is likely to be seen in future. Every one of its features is distinctive, and in view especially of its characteristic twin fuselage, there is very little possibility of error in recognition.

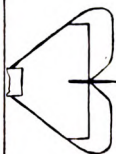
TRIPLANES



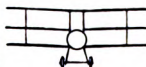
FOKKER



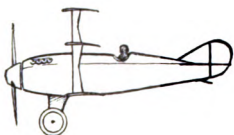
②



SOPWITH



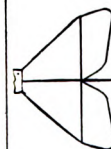
②



CURTISS



②



CAPRONI



⑧



SPACE FOR NOTES BY THE READER ON NEW
TRIPLANES

P 3

DIVISION II

SEAPLANES AND FLYING BOATS

Seaplane Identification Diagrams :—

Float Type	.	.	.	.	.	.	.	.	.	78
Flying Boat Type	.	.	.	.	.	.	.	.	.	82

Seaplanes
Flying Boats

Seaplanes, Single Airscrew Tractor Float Type - F 21**HAMBLE BABY.** [British (42).] **F 21.034.21**

This is very like the Sopwith Baby, but the tail planes are of quite a different shape.

SOPWITH BABY. [British (42).] **F 21.034.21**

This is a scout seaplane with a rotary engine. The tail should receive attention ; it differs from the usual Sopwith tail, but is still unique.

HANDLEY-PAGE N.2A. [British (42).] **F 21.034.54**

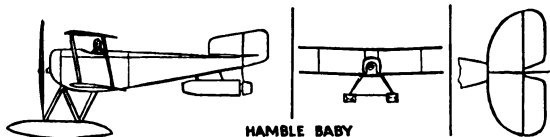
A two-seater float seaplane. It is unusual for a two-seater, in that it only has one pair of struts on each side of the fuselage. The high fin and long rectangular rudder, also the square gap dividing the elevators, are very noticeable.

Single Airscrew Float Type Tractor Seaplane,
with two pairs of struts on each side of
fuselage - - - - - F 21.035

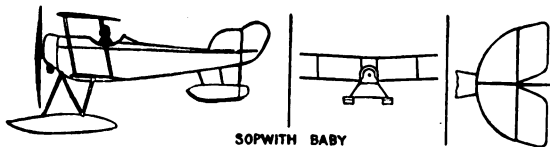
N.I.B. WESTLAND. [British (42).] **F 21.035.51**

This scout seaplane has two pairs of struts on each side of the fuselage. The float struts are unusual for a scout. The triangular tail and rounded rudder, which does not reach to the bottom of the fuselage, should be noted.

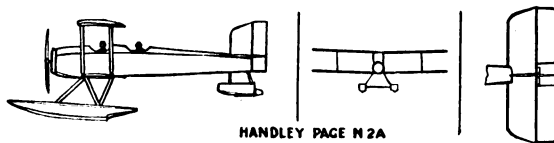
SEAPLANES



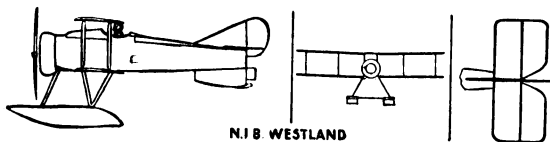
HAMBLE BABY



SOPWITH BABY



HANDLEY PAGE N2A



N.I.B. WESTLAND

FAIREY CAMPANIA.

[British (42).]

F 21.035.54

Notice overhang to the upper plane and kingpost bracing. This seaplane has two pairs of struts on each side of the fuselage, and shorter floats than the Wight machine. The tail planes and elevators are of a different shape. The fin also is not curved in this particular make.

**Single Airscrew Float Type Tractor Seaplane,
with parallel type centre section struts, and
more than two pairs of struts on each side
of fuselage**

F 21.035**SHORT S 184.**

[British (42).]

F 21.035.54

This is similar in many respects to the Wight Seaplane and also to the Campania, but careful attention to float struts and shape of tail and tail float will prevent confusion.

WIGHT SEAPLANE.

[British (42).]

F 21.036.54

This should be carefully distinguished from the Campania. The floats of the Wight Seaplane are pointed, and have three steps on the undersurface. There are also three pairs of struts a side. The tail plane and elevators together form a rectangle with rounded corners.

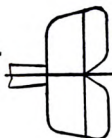
**SPACE FOR NOTES BY THE READER ON NEW
SEAPLANES**

F2

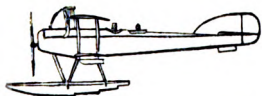
SEAPLANES (Continued)



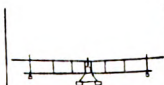
FAIREY CAMPANIA



SHORT S.184



WIGHT SEAPLANE



SPACE FOR NOTES BY THE READER ON NEW
SEAPLANES

F 2

F.B.A. (Franco-British Aviation Co.).

[British (42).]

B 24.036.42

Much used by all the Allies. The rotary engine, slung high between the planes, and the peculiarly uplifted tail, are the best guides to identification.

N.A.D.

[British (42).]

B 24.036.54

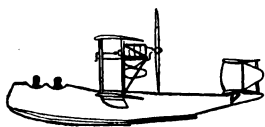
A flying boat, with the engine placed very high up between the planes. The pilot and the observer sit right in the bow of the boat. It has a biplane tail of very characteristic shape.

**SPACE FOR NOTES BY THE READER ON NEW
SEAPLANES AND FLYING BOATS**

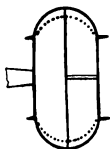
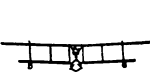
FLYING BOATS



F.B.A.



N.A.D.



**SPACE FOR NOTES BY THE READER ON NEW
SEAPLANES AND FLYING BOATS**

Memoranda

DIVISION III

AIRSHIPS

A Table to Illustrate the Development of the Airship	-	-	-	86
Airship Identification Diagrams	-	-	-	90
Key to Frontispiece	-	-	-	98

Airships

A TABLE TO ILLUSTRATE THE DEVELOPMENT OF THE AIRSHIP

Year.	Name of Dirigible.	Dimensions of Envelope.						Ballonets.	Remarks.
		Length.		Diameter.		Volume.			
		Metres.	Feet.	Metres.	Feet.	Cub. M.	Cub. Ft.		
1783	Meusnier *	-	-	-	-	9,900	349,668	1	Manually driven.
1853	Giffard—	-	-	-	-	-	-	-	-
1855	No. 1 *	-	-	-	-	2,500	88,300	...	Steam engine driven.
1870	" 2 *	-	-	-	-	3,200	113,024	...	" "
1870	Dupuy de Lôme	-	-	-	-	3,454	121,995.3	1	Manually driven.
1872	Hahnlein †	-	-	-	-	2,408	85,050.5	1	Gas engine driven.
1883	Tissandier *	-	-	-	-	1,000	35,320	1	Electrically driven.
1884	Renard-Krebs *	-	-	-	-	1,864	65,836.5	1	" " one
1897	Schwarz †	-	-	-	-	3,697	130,578	...	elevator. Two screws for steering, and one screw for eleva- tor. Gas engine.
THE PETROL ENGINE DRIVEN DIRIGIBLE									
1898	Santos Dumont—	-	-	-	-	180	6,357.6	1	...
1899	No. 1 *	-	-	-	-	500	17,660	...	...
1899	" 3 *	-	-	-	-	420	14,834.4	1	...
1900	" 4 *	-	-	-	-	550	19,426	1	...
1900	" 5 *	-	-	-	-	11,300	399,116	...	...
1900	Zeppelin—No. 1 †	-	-	-	-	630	22,251.6	1	...
1901	San'os Dumont—	-	-	-	-	1,257	44,397.2	1	...
1901	No. 6 *	-	-	-	-	-	-	-	...
1901	" 7 *	-	-	-	-	-	-	-	...
* French. † German.									

* French.

† German.

EARLY AIRSHIPS



Meuisnier (1783)



Giffard No 1 (1855)



Giffard No 2



Dupuy de Lôme (1870)



Hahnlein (1872)



Tissandier (1883)



Renard-Krebs (1884)



Schwarz (1897)



Santos Dumont No 1 (1898)



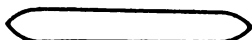
Santos Dumont No 3 (1899)



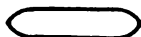
Santos Dumont No 4 (1900)



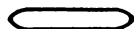
Santos Dumont No 5 (1900)



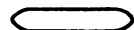
Zeppelin No 1 (1900)



Santos Dumont No 6 (1901)



Santos Dumont No 7 (1901)



Santos Dumont No 9 (1901)



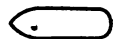
Santos Dumont No 10 (1901)



Deutsch de la Meurthe (1901)



Roze (1901)



Boatsky (1901)

The Development of the Airship.

A TABLE TO ILLUSTRATE THE DEVELOPMENT OF THE AIRSHIP (Continued)

Year.	Name of Dirigible.	Dimensions of Envelope.						Ballonets.	Remarks.
		Length.		Diameter.		Volume.			
		Metres.	Feet.	Metres	Feet.	Cub. M.	Cub. Ft.		
1901	Santos Dumont— No. 9 *	15.12	49.6	5.2	17.1	216	7,629.1	1	..
1901	" 10 *	48	157.4	8.5	27.9	2,010	70,993.2	2	..
1901	Deutsch de la Meurthe*	60	196.8	8.0	26.2	2,000	70,640	..	..
1901	Rozé *	45	147.6	7.5	24.6	2,800	98,896	..	..
1901	Bradsky †	34	111.5	6.1	20.0	850	30,022	(?)	..
1902	Severo †	30	98.4	12.0	39.36	2,400	84,768	..	..
1902	Lebaudy (Julliot) *	58	190.2	9.8	32.1	2,284	80,670.8	..	..
1902	Spencer §	23	75.4	6.0	19.6	1,860	65,695.2	1	..
1904	Julliot " Patrie " *	60	196.8	10.8	35.4	3,250	114,790	1	..
1905	Zeppelin—No. 2 †	128	419.8	11.70	38.4	11,430	403,707.6	1	..
1906	" Ville de Paris " *	62	203.3	10.5	34.4	3,200	113,024	..	..
1906	Comte de la Vaulx *	32.5	106.6	6.5	21.3	720	25,430.4	1	..
1906	Parseval—No. 1 †	48	157.4	8.7	28.5	2,500	88,300	2	..
1907	Santos Dumont— No. 16 *	21	68.9	3.0	9.8	90	3,178.8	1	..
1908	Zeppelin—No. 3 †	136	446.0	13.0	42.6	15,000	529,800	..	..
1908	" 4 †	136	446.0	13.0	42.6	15,000	529,800	..	..
1908	Julliot " La Repub- lique " *	61	200.0	10.8	35.4	3,700	130,684	1	..
1908	Malécot *	33	108.2	7.3	23.9	1,054	37,227.3	1	..
1908	Clement-Bayard *	46.25	151.7	10.58	34.8	3,500	123,620	2	..
1908	Parseval—No. 2 †	58	190.2	9.5	31.1	3,800	134,216	2	..
1908	Major Gross †	40	131.2	12.0	39.36	1,800	63,586	1	..

* French.	† German.	‡ Spanish.	§ English.
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* French.

† German.

‡ Spanish.

§ English.

EARLY AIRSHIPS (Continued)



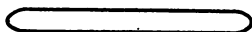
Severs (1902)



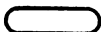
Santos Dumont No 16 (1907)



Lebaudy (Julliot) (1902)



Zeppelin No 3 (1908)



Spencer (1902)



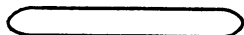
Zeppelin No 4 (1908)



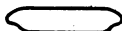
Juillot "Patrie" (1904)



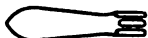
Juillot "La Republique" (1908)



Zeppelin No 5 (1905)



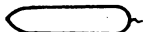
Malécot (1908)



Ville de Paris (1906)



Clement Bayard (1908)



Comte de la Vaulx (1906)



Parseval No 2 (1908)



Parseval No 1 (1906)



Major Cross (1908)

The Development of the Airship.

FRENCH AIRSHIPS

The accompanying silhouettes give an idea of the shape and size of the more important lighter-than-air craft. All the airships illustrated are in use at the present time, or are of sufficient historical importance to warrant a place in these pages. The sketches are all to the same scale, and a vessel which reached from side to side of the page would be 720 ft. long.

The **ASTRA**, **CHALAIS**, **CLEMENT-BAYARD**, **LE-BAUDY**, and **ZODIAC** are all successful non-rigid dirigibles of French design and manufacture. The **SPIESS** was a rigid airship with a built-up wooden framework. It was an unsuccessful experiment though an interesting example.

FRENCH AIRSHIPS



ASTRA



CHALAI



CLEMENT-BAYARD



LEBAUDY



SPIESS



ZODIAC

AIRSHIPS IN BRITISH SERVICE

The **ASTRA TORRES** is one of a successful type of non-rigid airship. The cross section, it should be noticed, is of trefoil shape.

The **PARSEVAL** is the only successful non-rigid airship of German design ; several aircraft of this type were in use in England before the war.

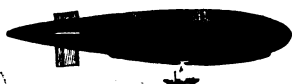
The **FORLANINI** is a successful Italian design.

The other airships — the **S.S.** (or **BLIMP**), **COASTAL PATROL**, and **BRITISH RIGID**—represent developments due to British initiative since the outbreak of war, and all, particularly the **S.S.** and **C.P.** types, which are non-rigid, have done enormously useful work.

AIRSHIPS IN BRITISH SERVICE



ASTRA TORRES



PARSEVAL



S. (OR BLIMP) - 1915 TYPE



FORLANINI



S.S. - LATER TYPE



COASTAL PATROL



BRITISH RIGID

GERMAN RIGID AIRSHIPS

Three German rigid airships are illustrated, viz., a pre-war **ZEPPELIN** with box tail, multiple rudders and elevators; a **SUPER-ZEPPELIN** of the latest type; and a **SCHUTTE-LANZ**.

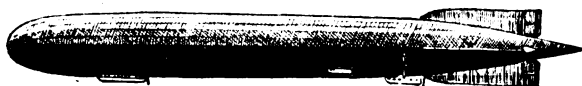
The **SUPER-ZEPPELIN** has a streamline body and cruciform tail, with monoplane rudders and elevators. This craft is really a composite Schutte-Lanz and Zeppelin, incorporating Schutte-Lanz aerodynamic design with Zeppelin internal construction. The Schutte-Lanz had a framework of wire-braced wood struts, while the Zeppelin, of course, has a lattice-girder frame of channel section aluminium alloy, and is without wire bracing.

Some more detailed notes concerning these airships are given on the next pages after the illustrations.

GERMAN RIGID AIRSHIPS



L12-TYPE ZEPPELIN



L17-TYPE ZEPPELIN



SCHUTTE-LANZ

ZEPPELIN AIRSHIPS

A type of rigid airship constructed with aluminium alloy lattice framework.

I.—1900-1914 Type

This airship has a long parallel body with bluff bow and stern. It is provided with an external keel gangway. It has two cars. The rudders and elevators are of the box type. A number of sizes have been constructed with base varying in length from 420 to 500 ft., and a capacity of 400,000 to 800,000 cubic ft. The total horse-power varied from 32 in the 1900 model to 540 in the later ones. The speed of the 1900 model was 17 miles per hour, whereas the later ones attained 47 miles per hour. Two two-blade and two four-blade wing airscrews were fitted to the later models.

II.—1913 L.2 Type

This airship has a long parallel body with a bluff bow, the stern is slightly streamlined, with external keel gangway and three nacelles. It is fitted with four four-blade airscrews. The rudders and elevators are of the box type. The overall length is 525 ft., and the capacity is 920,000 cubic ft. The H.P. of the engines totals 8,000, and the speed is 50 miles per hour.

III.—1915 Type

This also has a parallel body not quite so long in proportion as Types I. and II. The bow is bluff and the stern is streamlined. It has an external keel gangway and three nacelles. The two front ones of each are connected together. Two pusher airscrews are incorporated in accordance with the Schutte-Lanz practice. There are also two wing airscrews. The rudders and elevators are of the balanced monoplane type. The overall length is 525 ft., and the capacity 1,060,000 cubic ft. There are four engines totalling 780 H.P. The speed is 50 to 55 miles per hour.

IV.—1916 L.30 Type

This is the so-called Super-Zeppelin. The general construction of the girders is very considerably altered from that of the previous types, and many of the features of the Schutte-Lanz are incorporated. There are five nacelles (two forward and combined), one aft and two amidships and abreast. It has a short parallel body, a long rounded bow, and a long streamlined stern. Balanced monoplane rudders and elevators are employed. There are six motors totalling 1,140 H.P., driving six two-blade airscrews; two of each are of tractor wing type, and four of the pusher type. The overall length is 640 ft.; capacity, 2,000,000 cub. ft.; speed, 60 miles per hour.

SCHUTTE-LANZ AIRSHIPS

These are rigid airships constructed with a wood lattice framework which is braced with wire.

S.L.1 Type

This has a characteristically cigar-shaped body. It has two nacelles which are provided with exposed light lattice girder undercarriages. The elevators and rudders are of the monoplane form. Two 250 H.P. Daimler engines (total 500 H.P.) drive two 3-blade airscrews. The overall length is about 425 ft., and the capacity 706,000 cubic ft. Speed, 40 miles per hour.

S.L.2 Type

The cross section of this airship is polygonal. The body is parallel for a considerable length, terminating at the forward end with a blunt nose, and streamlined for a considerable distance towards the stern. It is equipped with four cars, and has monoplane elevators and rudders. The 1914 model is approximately 470 ft. in length, with a capacity of 810,000 cubic ft. Four Maybach 180 H.P. engines (total 720 H.P.). Speed, 50 miles per hour. The 1915 model is approximately 540 ft. in overall length, with a capacity of 1,060,000 cubic ft. It is fitted with four 240 H.P. engines (960 H.P.). Speed, 50 miles per hour.

S.L.3 Type

This is similar in all respects to S.L.2 except that the two forward nacelles are united. The length is increased to 600 ft., and the capacity to 1,275,000 cubic ft., four 240 H.P. Maybach engines (total 960 H.P.) are fitted instead of Daimler, and the speed is 55 miles per hour.

SPAD
(French)
(See pp. 46 and 50.)

R.E.8
(British Govt.)
(See p. 40.)

CURTISS WIRELESS
(American)
(See p. 36.)

SOPWITH CAMEL
(British Proprietary)
(See p. 42.)

S.S. AIRSHIP
(British)
(See p. 92.)

ALBATROS D III.
(German)
(See p. 38.)

BRISTOL FIGHTER
(British Proprietary)
(See p. 46.)

KEY TO FRONTISPIECE

NOTE.—Reference should first be made to the Analytical Tables, immediately preceding the illustrations, pages 23 to 26, and then to the diagrams of the aircraft named above, when it will be observed that even in these cases recognition should be easy.

DIVISION IV

RELATIVE RANKS OF THE
SERVICE

**Relative
Ranks**

BADGES OF RANK

RANK.	FRENCH ARMY.*†		GERMAN ARMY.		BELGIAN ARMY.‡		U.S. ARMY.§	
	On Sleeve.		On Shoulder Strap.		On Collar.		On Shoulder Strap.	
General	.....		Gold and silver twist, 2 stars		2 vertical gold lace stripes		Coat of arms and 2 stars.	
Lieut.-General	3 small gold stars*		Gold and silver twist, 1 star		3 gold stars		1 large, 2 small stars.	
Major-General	2 small gold stars*		Gold and silver twist, no star		Gold thunderbolt		2 stars.	
Colonel	5 gold bars†		Silver twist, 2 stars		2 vertical gold lace stripes			
Lieut.-Colonel	3 gold and 2 silver bars		Silver twist, 1 star		2 gold stars		1 silver spread eagle.	
Major	4 gold bars†		Silver twist, no star		Gold thunderbolt		1 silver leaf.	
Captain	3 gold bars†		Straight silver cord, 2 stars		1 vertical gold lace stripe		1 gold leaf.	
Lieutenant	2 gold bars†		Straight silver cord, 1 star		3 gold stars		2 silver bars.	
2nd Lieutenant	1 gold bar†		Straight silver cord, no star		2 gold stars		1 silver bar.	
Warrant Officer	1 silver bar, red striped		.....		1 gold star		No badge.	
Sergeant-Major	2 broad gold bars†		Gold or silver collar lace, button either side		1 silver star		.....	
Feldwebel	1 broad gold bar		Plain collar lace, button either side		2 brown rings on cuff and 2 brown stripes above elbow		.....	
Sergeant	2 dark blue woollen bars		Collar lace		1 narrow brown ring on cuff		.....	
Corporal	1 dark blue woollen bar		Button either side of collar		1 broad brown ring on cuff		.....	
Unteroffizier	1 dark blue woollen bar		Cord "wings" on shoulders		.....		.....	
Private	Red, white and blue bar				.....		.....	
Gefreiter					.....		.....	
Bugler					.....		.....	

* The bars ("galons") are about 2 inches long; horizontal for officers, oblique for N.C.O.'s.

† Generals also wear these stars on front of képi throughout Army (otherwise grey-blue képi shows no badge of rank), and double dark blue piping to breeches.

‡ Silver for Cavalry and Chasseurs.

§ On overcoat—General to Brig.-General wear the badge of rank in dull bronze below the elbow, with two bands of black braid one above, one below badge. Colonel, 5 bands; Lieut.-Colonel, 4; Major, 3; Captain, 2; Lieutenant, 1; 2nd Lieutenant, no bands.

ARMY**NAVY***Field Marshal.**General.**Lieut. General.**Major General.**Brigadier General
(Brigade Commander R.F.C.)**Colonel.
(Group Commander R.F.C.)**Lieut. Colonel.
(Wing Commander R.F.C.)**Major.
(Squadron Commander R.F.C.)**Captain.
(Flight Commander R.F.C.)**Lieut.
(Flying Officer R.F.C.)**Second Lieut.
(Flying Officer or 2nd
Lieut. on probation.)**Admiral of the Fleet.**Admiral.**Vice Admiral.**Rear Admiral.**Commodore.**Captain
(Wing Captain R.N.A.S.)**Commander
(Wing Commander R.N.A.S.)**Lieut. Commander.
(Squadron Commander
R.N.A.S.)**Lieut.
(Flight Commander or
Flight Lieut. R.N.A.S.)**Sub. Lieut.
(Flight. Sub Lieut. R.N.A.S.)**Midshipman.* *R.N. or R.N.A.S.* *R.N.R.* *R.N.V.R.***Relative Ranks and Distinguishing Insignia
of the Services**

ROYAL AIR FORCE

					
FIELD MARSHALL	GENERAL	LIEUT-GENERAL	PILOT		
					
MAJOR-GENERAL	BRIGADIER-GENERAL		OBSERVER		
					
COLONEL	LIEUT-COLONEL	MAJOR			
					
CAPTAIN	LIEUTENANT	2 ND LIEUTENANT			
					
1 ST CLASS W.O.	2 ND CLASS W.O.	U.S. AIR SERVICE			
					
FLIGHT-SERGT	SERGEANT	CORPORAL	1 ST CLASS A.M.	2 ND & 3 RD	

DIVISION V

DECIMAL CLASSIFICATION OF
AEROPLANES

MEMORISING NUMBERS

IN connection with the description of each aeroplane in this book a somewhat unwieldy-looking number is given. All the digits of each number, however, have a special meaning, which is explained in the notes which follow on the "Numerical Classification." In certain cases, therefore, it will be found advisable to memorise the numbers. Now it is not an easy matter to intelligently commit to memory different groups of figures. It can, of course, be accomplished in parrot-like fashion by constant repetition and the application of considerable effort. But this method proves ineffective when the numbers have to be instantly recalled over long periods of time, whenever required.

In themselves, rows of figures rarely exhibit any characteristic feature or association that facilitates committal to memory. It must be borne in mind that the underlying principle of modern methods of memory training is that of the association of ideas that are reminders, connecting links, or catenations of any items to be memorised. To memorise figures according to this system, what is known as the "Figure Alphabet" has been devised.

An inspection of the accompanying table will show that each figure in this "Figure Alphabet" is represented by one or more consonants or consonant combinations of the alphabet (*w* and *x* excepted). When, therefore, it is desired to commit a number to memory, first its consonants are written down; then vowels are arbitrarily interpolated, so as to make a pronounceable word, which has some association, however remote, with the particular matter represented by the figures. This word is accordingly memorised in conjunction with the association that has occurred when compiling it.

THE FIGURE ALPHABET

0	1	2	3	4	5	6	7	8	9
s	t	n	m	r	l	sh	k	f	p
z						zh	c	v	b
						(hard)			
c							ch	ch	
(soft)							(soft)	(hard)	
							g		
							(hard)		
							qu		
							ng		

At first glance this figure alphabet may appear somewhat arbitrary, but it is well to adopt it, as it has been in use for a great many years by students of mnemonics. Every follower of the Pelman system is familiar with it, as it has been incorporated by Mr W. J. Ennever,

who founded this system of memory training over twenty years ago. If the table is going to be made use of, it must, of course, be memorised ; this may be done by associating the shape of the figures with the particular letter of the alphabet allocated to them. Thus the single stroke letter *l* suggests 1 ; the double stroke letter *n*, 2 ; the treble stroke letter *m*, 3 ; the terminal letter *r* of the word four, 4. The similarity of the script letters *f* and *p* suggest 7 and 9 respectively. The letters *v* and *b* are employed interchangeably on account of their similarity in sound. The sound of *sh* or soft *ch* serves as a reminder of 6. Of the remainder of the alphabet the harder sounds are allotted to 7 ; while *s*, *z*, and the soft *c* are reserved for 0.

It will not be found quite so easy, as it at first sight appears, to make up a pronounceable word which can be readily associated with the particular matter indicated by the group of figures required to be memorised, but it is only a question of practice.

When applying the system to the memorising of the particular series of numbers employed for describing the detail characteristics of various aeroplanes, a careful analysis should be made of the numerical classification tables, where it will be observed that the first figure invariably represents the number of the planes. Two figures only have to be committed to memory to indicate the number of aircrews, and whether they, and the aeroplane to which they are fitted, are tractor, pusher, or combined types. The next two figures, viz., .03, appear in every aeroplane number, as it is what is known in the decimal classification system as a "combination subdivision number." It is employed to indicate that any succeeding figures deal with some detail of the *construction* of an aeroplane, and with no other feature.

It will, in short, be gathered from the foregoing that the only really important figures to memorise are the last three of each group, thus reducing the whole proposition to a comparatively simple matter.

DECIMAL CLASSIFICATION OF AEROPLANES

It will have been noted that a number is associated with the description of each aircraft in this book. This number is comprised of digits, each one having a special meaning. At the same time it places the aeroplane it describes—with all its attendant peculiarities—in its correct classification as regards the entire field of human knowledge. This method of numbering is known as the Decimal Classification System. The scheme, originally devised by Melvil Dewey in America, and further developed by the Institut International Bibliographie of Brussels, though not adopted to any extent in this country, is employed by the Bureau Bibliographique de Paris and the Concilium Bibliographicum of Zurich, and in numerous other foreign institutions and libraries, and its use is rapidly spreading in professional, scientific, engineering, and commercial circles. In short, the system consists in the division of the entire field of knowledge, which is regarded as unity, into nine main decimal divisions, 0.1 to 0.9 (for practical application

the decimal point is dropped though always understood). Any data of such general character as to belong to none of these nine divisions is indicated by a cipher, and forms a tenth class. Those who are further interested in the details of this system should refer to the "Aviation Pocket Book."

In accordance with the system above referred to, Aeronautical Engineering (Locomotion through the Air) is assigned the number 629.13, this being Class 6 (Applied Sciences). Division 2 (Engineering), Section 9 (a particular branch of Engineering), Subsection 1 (Locomotion), Division of Subsection 3 (Locomotion through the Air).

The main subdivisions of Aeronautical Engineering are as follows:—

629.13.

- 1
- 2 Lighter-than-Air Craft, Aerostats.
 - 2.1 Captive Balloons, Kite Balloons.
 - 2.2 Airships, Dirigible Balloons.
- 3
- 4
- 5 Heavier-than-Air Craft, Aeroplanes.
 - 5.1
 - 5.2 Aeroplanes. (Abbreviation for Number is "P.")
 - 5.3 Kites.
 - 5.4 Helicopters.
 - 5.5 Hydro-aeroplanes. (Abbreviation for Number is "S.")
 - 5.51 Seaplanes, Float Type. (" " "F.")
 - 5.52 Seaplanes, Boat Type. (" " "B.")
 - 6 Parachutes.
 - 7
 - 8
 - 9

The following special table of common subdivisions, any one of which can be attached to any one index number, refers to component parts of the construction of aircraft.

- .01 Component Parts of Aircraft.
- .011 Component Parts of the Structure of Aerostats.
- .012 Component Parts of the Structure of Aeroplanes.
- .013
- .014 Organs for Propulsion and Steering, including Air-screws, Rudders, Ailerons.
- .015 Organs for Manœuvring or Landing.
- .016
- .017
- .018
- .019 Various Accessory Apparatus.

Reference to the above table indicates that aeroplanes have the sub-

division number "52" allotted to them. As it is inconvenient for the purpose of this particular work to be continually repeating such a lengthy group of figures as 629.135.2, this specified series of digits can well be represented by a single character, say "P." Thus in the following table, P 1 really represents 629.135.21. Similarly the numbers allotted for seaplanes with floats [629.13.551] and for flying boats [629.13.552], can be abbreviated to "F" and "B" respectively.

It will be observed that the following classification is arranged on the basis that the preliminary main tables deal with (a) the number of the planes; (b) the number of airscrews; and (c) whether the aeroplane is a tractor, pusher, or combined machine; e.g., P 21 represents a biplane, single airscrew, tractor.

In conjunction with these first tables, a further series of numbers is provided, beginning with .03, which cover particulars as to details of the interplane strut system usually employed. This provides means for specifying an aeroplane very closely. As an example:—P 21.034 represents a biplane, with single airscrew, tractor type, having a single pair of struts on each side of the fuselage.

As even this lengthy description will be found insufficient at times, a further table (which follows) has been compiled to indicate the form of stagger, dihedral (if any), and type of engine. Thus if the digits ...53 are added to the above example, the further information is available that the machine has a forward stagger, both the main planes are set with a dihedral angle, and the engine is of the vertical type—the number now appearing as P 21.034.53. A further number in brackets is utilised to indicate nationality, as per the last table.

As these numbers, in the case of this work, are always intended to be utilised in conjunction with the illustrations, their complication will be more apparent than real; moreover, when once accustomed to their use, it is felt that the great advantage gained will far more than compensate the reader for his efforts.

A good method for readily memorising these seemingly unwieldy numbers is given just prior to this explanation of the system.

629.13.52 } Aeroplanes
or P }

P 1 Monoplanes

- .1 Single Airscrew Tractor.
- .2 Double " "
- .3 Multi- " "
- .4 Single Airscrew Pusher.
- .5 Double " "
- .6 Multi- " "
- .7 Double Airscrew Tractor Pusher.
- .8 Multi- " " "

P 2 Biplanes

- | | | | |
|----|--------|----------|-----------------|
| .1 | Single | Airscrew | Tractor. |
| .2 | Double | „ | „ |
| .3 | Multi- | „ | „ |
| .4 | Single | „ | Pusher. |
| .5 | Double | „ | Pusher. |
| .6 | Multi- | „ | „ |
| .7 | Double | „ | Tractor Pusher. |
| .8 | Multi- | „ | „ „ |

P 3 Triplanes

- | | | | |
|----|--------|----------|-----------------|
| .1 | Single | Airscrew | Tractor. |
| .2 | Double | „ | „ |
| .3 | Multi- | „ | „ |
| .4 | Single | „ | Pusher. |
| .5 | Double | „ | „ |
| .6 | Multi- | „ | „ |
| .7 | Double | „ | Tractor Pusher. |
| .8 | Multi- | „ | „ „ |

P 9 Multiplanes

- | | | | |
|----|--------|----------|-----------------|
| .1 | Single | Airscrew | Tractor. |
| .2 | Double | „ | „ |
| .3 | Multi- | „ | „ |
| .4 | Single | „ | Pusher. |
| .5 | Double | „ | „ |
| .6 | Multi- | „ | „ |
| .7 | Double | „ | Tractor Pusher. |
| .8 | Multi- | „ | „ „ |

INTERPLANE STRUTS

(The following tables, where they apply, are intended to be employed in conjunction with the P 1, P 2, P 3, and P 9 (aeroplane) Tables given above, or the similar "S" and "B" tables—Seaplanes and Flying Boats.)

•03 Interplane Struts.

- | | |
|------|--|
| •031 | Single strut on each side of fuselage, per interplane space. |
| •032 | Single set of vee type struts a side. |
| •033 | Single pair of struts a side and aileron strut. |
| •034 | Single pair of struts a side. |
| •035 | Two pairs ditto. |
| •036 | More than two pairs ditto. |

TABLE TO INDICATE CONDITIONS AS STAGGER, DIHEDRAL, AND TYPE OF ENGINE

(To be employed in conjunction with the Interplane Strut Tables given previously)

- | | |
|---|--|
| <p>1. Forward Stagger, no Dihedral</p> <ol style="list-style-type: none"> 1. Rotary engine. 2. Radial engine. 3. Fixed vertical engine. 4. Vee type engine. 5. Fixed arrow type engine. 6. Differential type engine. 7. Turbine. <p>2. Forward Stagger, with Dihedral</p> <ol style="list-style-type: none"> 1. Rotary engine. 2. Radial engine. 3. Fixed vertical engine. 4. Fixed Vee type engine. 5. Fixed arrow type engine. 6. Differential type engine. 7. Turbine. <p>3. Forward Stagger, with Dihedral on Bottom Plane only</p> <ol style="list-style-type: none"> 1. Rotary engine. 2. Radial engine. 3. Fixed vertical engine. 4. Fixed Vee type engine. 5. Fixed arrow type engine. 6. Differential type engine. 7. Turbine. <p>4. No Stagger, no Dihedral</p> <ol style="list-style-type: none"> 1. Rotary engine. 2. Radial engine. 3. Fixed vertical engine. 4. Vee type engine. 5. Fixed arrow type engine. 6. Differential type engine. 7. Turbine. | <p>5. No Stagger, with Dihedral</p> <ol style="list-style-type: none"> 1. Rotary engine. 2. Radial engine. 3. Fixed vertical engine. 4. Vee type engine. 5. Fixed arrow type engine. 6. Differential type engine. 7. Turbine. <p>6. No Stagger, with Dihedral on Bottom Plane only</p> <ol style="list-style-type: none"> 1. Rotary engine. 2. Radial engine. 3. Fixed vertical engine. 4. Vee type engine. 5. Fixed arrow type engine. 6. Differential type engine. 7. Turbine. <p>7. Back Stagger, no Dihedral</p> <ol style="list-style-type: none"> 1. Rotary engine. 2. Radial engine. 3. Fixed vertical engine. 4. Fixed Vee type engine. 5. Fixed arrow type engine. 6. Differential type engine. 7. Turbine. <p>8. Back Stagger, with Dihedral</p> <ol style="list-style-type: none"> 1. Rotary engine. 2. Radial engine. 3. Fixed vertical engine. 4. Fixed Vee type engine. 5. Fixed arrow type engine. 6. Differential type engine. 7. Turbine. <p>9. Dihedral on Top Plane only</p> |
|---|--|

TABLE OF COMMON SUBDIVISIONS— GEOGRAPHICAL

(It will be noted that numbers indicative of a country are always inserted in brackets)

The Modern World

- (4) Europe.
- (5) Asia.
- (6) Africa.
- (7) North America.
- (8) South America.
- (9) Oceania.
- (∞) International—Universal.

(4). Europe

- (41) Scotland.
- (41.5) Ireland.
- (42) England.
- (42.9) Wales.
- (43) Germany.
- (43.6) Austro-Hungary.
- (44) France.
- (45) Italy.
- (46) Spain.
- (469) Portugal.
- (47) Russia.
- (48) Scandinavia.
- (481) Norway.
- (485) Sweden.
- (489) Denmark.
- (492) Holland.
- (493) Belgium.
- (494) Switzerland.
- (495) Greece.
- (496) Turkey in Europe.
- (497.2) Bulgaria.
- (498) Rumania.

(5). Asia

- (51) China.
- (52) Japan.
- (53) Arabia.
- (54) India.
- (55) Persia.
- (56) Asia Minor.
- (57) Siberia.
- (58) Afghanistan.

(6). Africa.

- (62) Egypt.

(7). North America

- (71) Canada.
- (72) Mexico.
- (73) United States.

(8). South America

- (81) Brazil.
- (82) Argentine.
- (83) Chile.
- (84) Bolivia.
- (85) Peru.
- (86) Colombia.
- (87) Venezuela.

(9). Oceania

- (91) Malay.
- (931) New Zealand.
- (94) Australia.
- (98) Arctic Regions.
- (99) Antarctic Regions.

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